

A STUDY OF THE FACTORS INFLUENCING THE LOCATION
OF WHEAT STORED BY FARMERS

by

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INTRODUCTION

Wheat is the most important cash crop grown in Kansas. Although it is grown throughout the state, it is most important in the western two-thirds of the state or the area lying west of the Flint Hills. Kansas is the leading wheat producing state with major emphasis on production of Hard Red Winter Wheat.

Wheat being a major food crop requires physical storage adequate to prevent damage which would reduct its value or contamination which would make it unfit for human consumption.

The use of modern harvesting and transporting machinery has shortened the Kansas wheat harvest season. High production during recent years has increased the demand for storage facilities capable of handling large quantities of wheat within a short time and utilizing methods which will maintain the general quality of the food product.

Stocks of wheat stored on Kansas farms indicate that farm storage is a very important part of the entire wheat storage system. During the 24 crop year period 1926-1950; October 1 farm stocks varied from 20,440,000 bushels in 1936-1937 to 137,617,000 bushels in 1947-1948. In 1936-1937, October 1 farm stocks totaled only 17 percent of the production for that crop year while in 1942-1943, October 1 farm stocks totaled 63 percent of the production for that crop year. During the 24 crop year period, the October 1 farm stocks averaged about 69,906,800 bushels or about

43 percent of the average wheat production for the same period.¹

Part of the farm stored wheat is used on the farm for feed, seed, and ground at mill for home use or exchanged for flour while the remainder enters commercial market channels. In Kansas, during the 1926-1950 period, an average of 22,367,540 bushels were used for feed, seed, and ground at mill for home use or exchanged for flour. Of this amount about 13,340,250 bushels were used for seed, 8,829,710 bushels were used for feed, and 334,580 bushels were used ground at mill for home use or exchanged for flour.² Since a large part of the seed wheat may be seeded before October 1 and since some wheat is stored on the farm for only a short period of time, the October 1 farm stocks do not fully indicate the actual quantity of wheat in farm storage during the first months following the harvest.

Since farm storage is closest to the production area and because individual farm production varies widely, there tends to be greater variation in the percent of the crop stored in farm bins than in non-farm facilities during the months immediately following harvest.

When there is a very large crop, farm storage of some form is needed to hold the excess wheat which cannot be handled by commercial facilities. When the crop is short, farmers often

¹Calculated from table "Wheat--Stocks on farms", Kansas Crop and Livestock Statistics 1949 Annual Summary, Topeka, Kansas State Board of Agriculture, 1950, p. 23.

²Ibid., p. 36.

sell or store in commercial facilities thus leaving much farm storage space empty. Specialization in farming often prevents use of unused farm storage for other crops and most farm storage is not designed for non-grain storage uses. Steel type buildings erected on farms during recent years have greater flexibility in use than conventional type bin storage units. Even these steel type buildings often require additional expense for floors and additional wall reinforcement before they are suitable for proper grain storage.

Expanded farming operations often cause all or part of the wheat crop to be produced on land farther from the farmstead than from a commercial elevator. Under these conditions, transportation to an elevator may be cheaper and less time consuming than farm storage.

Short periods of land tenure, crop rotations, and inconvenience of caring for stored grain may prevent erection of farm storage facilities on lands isolated from the farmstead.

Disagreement exists among various groups as to whether future storage facilities for wheat should be in the form of farm storage or whether commercial storage should replace all or part of the present farm storage facilities. Farmers do not agree as to the extent to which farm storage should be used. Storage payments to commercial storage operators and to farmers for storage of wheat under Commodity Credit Corporation seal indicates that such payments have not been a stimulation to storage in one position only. Discontinuance of storage payment in 1951 may cause a shift

in the location of storage facilities.

Farmers are faced with the problem of where to store their wheat each year. Those who do not have farm storage facilities must decide whether to build sufficient storage to provide room for their entire crop or whether to plan to store all or part of their crop in commercial storage facilities. Those who have farm storage space must decide whether to use all or part of this space for wheat, reserve space for other uses, or leave the storage space unused and store in commercial facilities.

To answer such problems one must consider each of the many factors which affect the use of farm storage. One or more of the factors may prove to be of greatest importance during a given season and become the determining factor for that season. In such a case, consideration could be limited to the important factor or factors for that season. Usually more than one factor must be considered and the first problem is to discover the determining factor or factors. The relative importance of the determining factors can be considered and then storage plans may be made on the basis of particular needs.

Some studies have been made in an attempt to answer these storage problems but they have usually been related to only a single factor or a small group of factors which farmers consider when deciding whether to store wheat on the farm or in commercial storage. Actually the farmer must consider all the factors which influence his decision concerning storage for the present time or for a long period of years, carefully consider their

importance, then decide his course of action. Failure to consider all factors by confining a study to selected factors which may not be the most important under the circumstances ignores the total problem which the farmer must answer to plan his storage.

This study is designed to learn the most common factors which are currently considered by farmers when deciding whether to store wheat on the farm or in commercial storage and then to show the importance and influence of each on storage plans. An evaluation of the most common factors may be used as a guide by farmers who are facing the problem of where they should plan to store wheat; by governmental agencies in planning programs concerning storage position; by members of the grain trade affected by farm storage; and by the general public as consumers of the food crop.

REVIEW OF LITERATURE

Modern theories attempt to show reasons why farmers store food grains and where they store these grains. These theories probably can be grouped into three classes as follows:

1. Theories concerned with the supply of the grains.
2. Theories concerned with the factors which may determine whether the farmer is permitted to store the grains.
3. Theories concerned with factors which may determine whether the farmer desires to store on the farm or in some other storage position.

Such terms as "Ever Normal Granary" and "Price stabilizing" are not new in the history of grain storage. There are great differences in the use and need of storage in the different parts of the world so different theories apply to different areas. Some areas store grain because there is a surplus of that grain while other areas are nearly always short of food and store when possible to prevent additional famine.

"Granaries" on farms and in the agricultural villages have been used for centuries for storage by farmers who desired to store food grains. Farmers point with pride to a full granary; while in time of famine, nations of hungry people look to people with full granaries and ask for food.

The reasons for storing food grains on farms and in the villages have changed many times during the past few centuries and today there is wide difference in the practices used in the various parts of the world.

Ancient man depended upon natural plant and animal life for his food supply. During earliest times he probably spent most of his time in search of food to satisfy his daily wants. He ate most food in its natural form and when he was unable to obtain sufficient supplies, he either went hungry, found new sources of supply, or perished. Thus many of the early people were nomadic tribes.¹ According to Gras, "Storage in nomadic

¹Gras, Norman Scott Brien, A History of Agriculture in Europe and America, New York; F. S. Crofts & Co., 1925, p. 6.

stage was an auxiliary to further production as seed was kept for the next year.¹ Storage of seed could exist only under conditions where there was cultivation of crops in some crude form. It is quite possible that before the days of cultivation people stored surplus amounts of food which they gathered from natural growth.

The history of storage by farmers is closely related to developments in cultivation of crops; animal breeding; population change; growth of transportation; governmental policy; and climate. These factors are still found to be among those which affect storage by farmers.

One of the best known examples of early agricultural storage is the story of Pharaoh's dream which was interpreted by Joseph about 1715 B. C. Joseph was placed in charge of collecting "corn" during the seven years of good crops to prevent famine during the seven famine years which were to follow. This "corn" was taken up and stored in the cities. All countries came to Egypt to buy "corn" during the famine.²

Famine and fear of famine have been major factors causing individuals and nations to store any surplus which they may have raised during a good year. Food grains are adapted to storage and this quality has helped man to store during good years so

¹Loc. cit.

²The Holy Bible, King James Version, Genesis, Ch. 41-2.

he could have seed and food during famine years.

Poor methods of production; prolonged periods of drouth; an increasing population; poor transportation; and improper storage of grains have caused most of the world to always be short of the desired amount of grain for food.

Storage in China

In China, extensive use has been made of various types of storage programs for many centuries. These storage programs have been designed to prevent famine, to help stabilize price, and to encourage agriculture to produce more food for the people. According to monthly bulletins preserved in Li Ki or Records of Rites in China, during the Yin Dynasty (1766-1122 B. C.) people were urged to plant wheat and not to be behind in season. Those missing the season would be punished.¹

During the Han Dynasty (202 B. C.-959 A. D.) the Chinese government established a constantly normal granary as an aid to farmers. The government purchased grain when it was surplus and cheap and placed it in storage. The grain was sold when grain was scarce and the price high. The purchase price was above the market price and the sale price was below the famine market price.² This action helped stabilize the price and also helped prevent famine. It is an early example of an attempt to

¹ Lee, Mabel Ping-Hua, The Economic History of China, New York: Longmans, Green & Co., 1921, p. 42.

² Ibid., p. 59.

control price. Since there has generally been a shortage of food in China, there have been more famine than surplus periods so such a plan could not fully work over a long period of time.

Even the Chinese farmers who produced the grain often found themselves without food during the famine years. Grains were common forms of exchange and after wages and taxes were paid there was often very little grain left for the farmer and his family. The importance of this tax payment by grains may be illustrated by saying that a statement of the government income during the Tang Dynasty (618-905 A. D.) showed more than 19,800,000 loads of grain received as tax payment.¹

Emperor Sun Chung (Sung Dynasty 960-1276 A. D.) in the tenth year of his rule restored the charity granary for the first time. An additional amount of grain equal to five percent of the regular grain collected as tax was collected from the farmers. This system of charity granaries made possible loans to the poor in time of famine. Previously this system was used during the Sui and Tang Dynasties.²

Later during the Sung Period (960-1276 A. D.) the Farm Loan System was devised so that a farmer could get two loans a year to produce crops. Interest was considered moderate for that period but was about forty percent. The loans were liquidated after

¹Ibid., p. 239.

²Ibid., p. 264.

harvest and the granary system was suspended.¹ This is an example of an early production loan to provide additional capital so that more food could be produced.

Another type of loan program was also used during the period of the Sung rule. Farmers could loan grain to the government and the government would store the grain until the farmer needed it for seed or for food. Under these conditions the grain was returned to the farmer as a relief measure.² In the United States we seldom think of storage to provide food or seed loans to farmers. However, during the 1930's there were relief measures which provided loans to United States farmers so they could buy seed wheat and other grains for seed. Famine conditions during early times in China were often prolonged because the people were so short of food supplies that they ate the seed stocks too.

The Tsai Nong Chang (Farmer Aiding Granary) was established by the government during the Yuan and Ming Periods (1227-1643 A. D.). All district officials were ordered to prepare granaries for the storage of the government grain. Again we find that much of the stored grains were collected as tax payments. A major reason for use of the Farmer Aiding Granary was to urge farm deserters to return to the farms and help produce additional food supplies.³

¹Ibid., pp. 79-80.

²Ibid., p. 83.

³Ibid., p. 100.

Chinese farmers have never had a surplus of grain to store as we consider the problem in the wheat areas of the United States. Most of the grain was consumed on the farm and many years there was not enough for the subsistence of the farm family. Any surplus resulting from a good crop would be stored as feed or seed to prevent starvation or crop failure the following year.

The primitive method of farming in many cases was not scientific and there were many crop failures. In a country with harvest failures and a large population famine usually follows each poor harvest. During progressive dynasties, the agricultural system flourished and there were much larger quantities of food than there were during the dynasties when efforts were concentrated on war.

In ancient China, one finds price stabilization, loan, and charity storage programs. Some of these were tried several times over a long period of time. Over population in relation to food supply left China short of good supplies of food much of the time. This condition makes any storage program merely a short time program to ease the undesirable conditions. Rice is a widely used crop in China and other heavily populated areas because it gives a high yield per acre and is needed to prevent starvation.

The series of trials with various types of granaries in China indicate that wheat is grown by the Chinese farmers as a crop to feed themselves and their families and is not a large scale cash crop as the crop is grown in the United States, Canada, Australia, and Argentina. The Chinese purpose for

storage was to try to prevent starvation among the members of the general public and to try to keep the individual farmer in farming operation so that he could at least provide food for himself and his family.

Storage in the Mediterranean Area

In the Mediterranean area one finds another ancient wheat production area. Wheat was grown on land flooded by the Nile River. This operation of seeding wheat on the land irrigated by the river required several bushels of seed per acre. The land was rich so good yields were obtained after each flood. Grain was stored in Egypt in granaries similar to some of our modern type elevators. Jacob described the Egyptian granaries thus:

The scribes of the granary and the grain measurers continued their work for a while, until the harvest was stored in the granary. This cylindrical mud structure was approximately five yards high and had two openings--one above, where workers standing on ladders emptied sacks; and the other below, through which the grain could be removed. The lower opening was always closed to keep out rodents.¹

In Greece farmers sold grain and contributed to the temple treasure. Jacob wrote,

The treasure consisted of granaries to which all Greece voluntarily contributed, of money accumulated by the sale of this grain, of fees from those initiated into the mysteries, and of precious objects of gold and silver--

¹Jacob. H. E., Six Thousand Years of Bread, Garden City, New York: Doubleday, Doran and Company, 1947, p. 66.

gifts from all over the world.¹

Storage in Peruvian Indian Villages

In the Indian villages of Peru, contented peasants tilled poor soil but used good farming methods to produce crops.

According to Jacob,

At the entrance to the village stood the granary, where grain was stored against crop failures; at the other end of the village was the garner for the Inca and the Court.²

Small groups of people throughout the world used good farming methods and irrigated lands to produce good crops. Often these people also fertilized their crops. Some of these small groups usually had surplus food grains for storage but the world in general was short of food so the small areas of surplus often were sought as prizes of war.

Storage in France

In France we find a grain trade dating back several centuries. According to Usher,

Country buying was not the primary or ordinary means of securing grain for the large towns, but an extraordinary device to secure supplies when the granaries of the towns ceased to promise all that could be sold in the metropolis.³

¹Ibid., p. 66.

²Ibid., p. 119.

³Usher, Abbott Payson, The History of the Grain Trade in France 1400-1710, Cambridge, Massachusetts: Harvard University Press, 1913, pp. 21-22.

Granaries outside the large towns were habitually concealed.¹

Before 1850, the granaries of the producer were important and trade was based on this system of storage. Later the merchants bought the grain and controlled the storage facilities.²

Between 1693 and 1709 grain merchants bought up local grains including grain still standing in the fields. Vast granaries were formed for export and prices were so high that local peasants could not afford to buy the grain they needed for food.³

The grain purchased by the merchants and placed in storage for export purposes did not pass through the local market facilities so there were no "fees" collected from the sale of this grain at the market. This condition reduced the supply on the local market and made the price extremely high since much of the actual supply was hidden and left the local market unused.⁴ Many towns depended on income from "fees" collected on grain sales in the local market as a source of revenue. The merchants who did not obtain their grain through the local market saved this fee and the revenues of the towns were reduced.⁵

Before 1660, rents in kind, permitted the filling of local granaries. By 1660, much of the grain was purchased direct from peasants by merchants for export storage.⁶ Many wealthy peasants

¹Loc. cit.

²Ibid., p. 25.

³Loc. cit.

⁴Ibid., p. 93.

⁵Ibid., p. 101.

⁶Loc. cit.

refused to bring grain to market and stored it on their farms to cause the price to rise.¹

The poor class of local peasants suffered because there was not sufficient grain at the local market to meet their food needs.

In 1539, the Lieutenant of the Bailli of Dijon issued an ordinance against merchants and other people who go daily to the market towns, where they buy grain and form granaries.²

He ordered that any grain in excess of private needs should be straightway sold on the public market.³

In France we find that there has usually been more food grains per person than in China. Areas of France did produce surpluses which were even used in the export trade. Usually only the rich peasants were able to hold grain in storage to demand a higher price.

Storage in England

In England some of the oldest specimens of domestic architecture are granaries.⁴ Wages were still paid with grain so according to Ernle, "The granary was therefore, rarely so full that any surplus remained for sale."⁵

Methods of cultivation were greatly improved and Trusser

¹Ibid., p. 111.

²Ibid., p. 141.

³Loc. cit.

⁴Ernle, The Right Honble Lord, English Farming Past and Present, Third Edition, London: Longmans, Green and Co., 1922, p. 5.

⁵Ibid., p. 12.

recommended two bushels of wheat be seeded per acre.¹ A major improvement was the discovery by Jethro Tull that drilling in rows was a better method of sowing wheat and other grains. Although Tull gave such advice in 1733 when he published his book, Horse-Hoeing Husbandry, it was not generally practiced until much later.²

The enclosure movement permitted better farming so crop production increased with the enclosure movement.³ These increased supplies gave farmers more grain to store for food and seed.

During the period 1514-1660, London had municipal regulation of grain trade and storage. Later these functions were performed by private firms after many people felt that private firms could do a better job.⁴

About 1620 A. D., public granaries were erected. Farmers could store the surplus of one year against the shortages of the next. This idea was borrowed from Holland.⁵ Bonded warehouses under the King's lock were established about 1663. Foreign grain could be stored, free of duty, until withdrawn for consumption.⁶

Probably one of the best known thinkers on the subject of food supply was Malthus. His book, Essay on the Principle of Population, was published in 1798. Malthus pointed out that food is necessary to man; that man tends to reproduce and

¹Ibid., p. 94.

²Ibid., p. 169.

³Ibid., p. 242.

⁴Gras, op. cit., p. 13⁴.

⁵Ernle, op. cit., p. 256.

⁶Ibid., p. 257.

although not formally stated in such terms, man tends to reproduce at a rate greater than the power of man and the earth to produce food.¹

According to Malthus, population increased at a rate which was a geometric ratio while food supply increased by an arithmetic ratio.² We find many followers of such thought in areas where food is scarce and in most parts of the world when there is economic depression.

Technological advance has tended to disprove the theory advanced by Malthus. The condition described by Malthus tends to exist in countries where there is dense population or where there is lack of technological advancement.

The Corn Laws of England prevented excessive exports and built up supplies during good years. The last seven years of the seventeenth century were poor crop years. The large reserve partially built up by this bounty was of importance during these seven poor years.³

Between 1811 and 1841, wheat production in British land was increased by five and one-half million quarters or 44 million bushels.⁴ By 1837 there were large barns on the farms and these were used for storing and threshing grain.⁵

¹ Haney, Lewis H., History of Economic Thought, New York: Macmillan Company, 1949, pp. 261-262.

² Ibid., pp. 263-264.

³ Ernle, op. cit., pp. 261-262.

⁴ Ibid., p. 272.

⁵ Ibid., pp. 357.

The harvest was only a part of the process of preparing the grain for market. After the threshing and cleaning, grain was measured and put in four bushel sacks ready for market.¹

Storage in Russia

Modern methods of cultivation were slow to develop in most of Russia. Seed sown per acre during the period 1905-1914 was 1.56 to 1.93 bushels in the South and 2.20 to 2.38 bushels in the North.² These amounts show great improvement over the much larger quantities seeded per acre during ancient times.

On March 25, 1917, the Government Grain Monopoly was introduced. This plan was continued by the Soviets when they took control.³ All surpluses of grain above the quantity necessary for the producer's own consumption became the property of the state at a fixed price.⁴

According to Timoshenko,

The agrarian revolution with its subdivision of large estates and equalizing of peasant land-holdings, accelerated the disappearance of grain surpluses from the market.⁵

By 1921, the New Economic Policy failed to produce sufficient food to feed the army, city workers, and others. Additional food had to be obtained from individual peasants. Trade was forbid in agricultural commodities and confiscated grains were common. All agricultural surpluses in excess of the

¹Loc. cit.

²Timoshenko, Vladimir P., Agricultural Russia and the Wheat Problem, Stanford University, California, 1932, p. 269.

³Ibid., p. 388.

⁴Ibid., p. 436.

⁵Ibid., p. 414.

consumptive needs which officials considered as very small were confiscated.

In Russia, terminal elevators developed before there were local elevators.¹ Between 1924-1927, the government and co-operative organizations built many local elevators (Capacity of 2.5 thousand tons or less to be classed as local elevators.) but during the 1927-1928 season many of these did not show a profit.²

In 1926, when the government grain-collecting organizations "contracted" (Bought) future crops the contracts or agreements included such conditions as use of approved cultivation practices.³

Exports were discontinued during the 1927-1928 season because the well-to-do peasants were reluctant to sell their surpluses at the low prices fixed by the government. They were also reluctant to expand production to meet the government goals.⁴ During the 1927-1928, 1928-1929 seasons there were special committees of poor peasants to check on well-to-do peasants who might conceal grain. There was a heavy fine for concealment.⁵

Consumer cooperative organization gained importance in collecting grain from producers in 1925-1926. In 1927-1928, the central cooperatives were given additional powers over the collection of grains so these producer cooperatives were handling most of the grain by 1930.⁶

¹Ibid., p. 348.

²Ibid., p. 349.

³Ibid., p. 262.

⁴Ibid., pp. 98-99.

⁵Ibid., p. 396.

⁶Ibid., pp. 444-445.

Storage in New Zealand

Although wheat is the major cash crop in New Zealand, little of it is exported. The large wheat crop in New Zealand in 1932-1933 was the immediate cause of the formation of the Wheat Purchase Board. In general, farmers there follow the following regulations in wheat marketing:

1. The farmer must declare the amount of wheat harvested.
2. All sales or purchases of wheat are made through the board.
3. The Board operates through the regular channels of trade so the grain merchants are now licensed agents of the Board.
4. All wheat is pooled and graded and the Board pays the producer on the basis of his wheat contribution to the pool.¹

Such a system of regulation tends to discourage farm storage to obtain price increases and provides some means of marketing all the wheat produced in the country.

¹Belshaw, H., and others, Agricultural Organization in New Zealand, Melbourne: 1936, Melbourne University Press, pp. 510, 780.

Storage in Australia

Australia is a major wheat exporting country. Most of this wheat is bagged and handled in flat storage. There is only one regular grade of wheat in Australia. It is called "F.A.Q." (Fair Average Quality). Anything below is inferior.¹

Australian wheat is usually bagged on the farm in three bushel lots. New South Wales has some bulk storage while there is very little in other areas. According to Wadham, the climate favors the use of bags and open storage. Also the production is so doubtful and variable in some areas that storage facilities would represent an investment which might not have consistent use.² Wadham felt that since climate permitted outside storage of sacked grain that such conditions had helped prevent systemization of a public storage system of elevators.³

There are three general methods of sale of grain which probably influence the importance of farmer storage and the things the farmer considers when he stores on the farm or in commercial storage. According to Wadham, the farmer can:

1. Sell outright to private merchants or to millers for cash.
2. Pool with volunteer pools and get roughly eighty percent of the estimated value upon delivery to country railway stations.
3. Store with private merchants, co-ops, etc., and

¹ Wadham, S. M., "The Wheat Industry", Annals of the Am. Acad. of Pol. and Soc. Sci., Philadelphia: 1931, 156-158:112.

² Ibid., p. 57.

³ Ibid., p. 112.

obtain necessary loans on the warehouse receipt.¹

Storage in Argentina

The typical coreal farmer in Argentina is strictly a grain farmer. He is called a "colono". He borrows from the local merchant or middleman (acopiador) to produce the crop. The local merchant usually requires that those in debt to him must trade at his store.²

The acopiador usually requires that the grain be delivered to him during or soon after harvest while the price is low. The farmer must deliver the grain in new jute bags which the acopiador sells. The acopiador has a partial corner on the wheat market. The Argentine government started a movement in 1935 to prevent this corner against the tenant wheat farmer. The government began construction of some three hundred country and terminal elevators at a cost of twenty-eight million dollars. The government planned to operate the elevators and issue negotiable warrants against the grain delivered to the elevators by farmers.³

¹Ibid., p. 111.

²Greenup, Ruth and Leonard, Revolution Before Breakfast, Argentina 1941-1946, Chapel Hill, N. C.: 1947, University of North Carolina Press.

³Loc. cit.

Storage in Canada

Canadian farmers have encountered situations similar to many of those found in the United States. Canada's wheat belt produces for a world market. According to Stewart; if a farmer is within a four mile radius of an elevator he will usually haul his grain directly from the threshing machine to the elevator.¹

According to the Canadian Grain Act; if a farmer desires to store or sell grain and is not satisfied with the grade as determined by the elevator operator, he can store it by weight if there is room and send a sealed sample agreed upon between himself and the elevator operator to the Chief of Grain Inspectors at Winnipeg.²

Farmers also can arrange with local elevators to store up to a carlot of wheat at a time and order their own car. As soon as the farmer delivers a carlot of wheat to the local elevator it can be loaded out and the farmer surrenders his storage tickets for a bill of lading. He pays the elevator one and three-fourths cents per bushel for services and can get a cash advance at local banks of about sixty percent of the market value of the carlot of wheat.³

Canada's surplus wheat producing prairie area had an agrarian movement similar to the series of such movements in the United States. The railroads granted monopoly loading privileges. This

¹ Stewart, James, "Marketing Wheat", Annals of the Am. Acad. of Pol. and Soc. Sci., Philadelphia: 1923, 107:187.

² Ibid., p. 188.

³ Loc. cit.

prevented farmers and other buyers from competing with the favored elevators. The Manitoba Grain Act of 1900 granted farmers and others the privilege of shipment from points even though there was an elevator at that shipping point. The elevators and railroads then cornered the railroad cars and the favored elevators were about the only ones to get railroad cars.¹

In 1901, The Territorial Grain Grower's Association was formed. This group entered a court charge against the railroads for unfair distribution of cars and won the case. The railroads were forced to distribute cars according to the Manitoba Grain Act.²

Fowke, in his discussions of Canadian agricultural policies, felt that some of the principal reasons for farmers organizing against the elevator-railroad monopoly were: low prices, low grades, excess dockage, and perhaps dishonest weight.³

Storage in the United States

In the early history of the United States, wheat was a food crop similar to other countries. The country was new and the people were not thickly populated but did consume the food crops produced. It was not until after the invention of the reaper and the expansion of the frontiers that there was a

¹ Staples, M. H., "The Agrarian Movement", Annals of Am. Acad. of Pol. and Soc. Sci., Philadelphia: 1923, 107:249.

² Ibid., p. 248-253.

³ Fowke, Vernon C., Canadian Agricultural Policy, Toronto: 1947, University of Toronto Press, p. 244.

great national wheat storage problem in this nation.

Since early land settlement patterns were usually of the village type the food was gathered and placed in the villages for storage. This was partially necessary to protect the food supplies from the Indians. The early Americans learned corn production techniques from the Indians. The production of corn for livestock feed left more of the wheat for food. Today we find that corn is a feed crop while wheat is priced so high that it is usually used only for food.

The reaper made it possible for man to harvest a much larger quantity of grain and to expand his acreage to the point where wheat became a cash crop of great importance. The farmers moved west and opened up vast new lands. The production increased rapidly and wheat became an export crop.

Many farmers felt that the elevators and the railroads took unfair advantages of the farmer who had wheat to sell and who was often in debt and needed an immediate source of income. Some of the farmers felt that agriculture had grown to the point where the industry could force its demands upon society. Many different organizations and societies were formed.

Early organizations which helped farmers with their marketing problems included the Grange and the Farmers' Union. Neither of these organizations was organized for this particular purpose but both promoted cooperative marketing facilities and

provided assistance for the grain farmer.¹

Later there were other organizations concerned with storage and marketing activities. In 1907, Everitt, author of The Third Power, said, "First, Have the farmers the facilities for holding them? and second, Can they hold them?" He believed that all farmers should hold grain to get a price increase. He believed that farmers were inclined to sell at harvest because they had often been disgusted with former results from holding grain.²

Nourse in 1916 said,

. . . the possibility of storing goods presents also the possibility of securing control of supplies and of exploiting this control in terms of speculative prices. But such control is very strictly limited in any line where production continues in the hands of a great body of independent operators, as is always the case of agriculture.³

In 1921, "The Committee of Seventeen", appointed by President Howard of the American Farm Bureau Federation, studied the grain situation and recommended the formation of U. S. Grain Growers, Inc. This agency was a national sales agency and handled wheat, rye, flax, and other grains.⁴ An effort was made to get each member to pool one-third of his wheat crop to provide for a normal exportable surplus.⁵

¹Barrett, Charles Simon, The Mission, History and Times of the Farmers' Union, Nashville, Tenn: 1909, Marshall & Bruce Co., p. 103.

²Everitt, J. A., The Third Power, Fourth Edition, Indianapolis: 1907, J. A. Everitt, pp. 108-109.

³Nourse, Edwin G., Agricultural Economics, Chicago: University of Chicago Press, p. 567.

⁴Kile, O. M., The Farm Bureau Movement, New York: 1921, Macmillan Company, p. 151.

⁵Ibid., p. 163.

Members of the Non-Partisan League in North Dakota wanted state-owned grain elevators. The group organized in 1915 primarily because of unfair grading and control of markets by business interests.¹

In some areas of the Pacific Northwest there are few elevators because sacked wheat is often piled on the ground until shipped.²

By the early 1930's there was a surplus of wheat in the United States. Farm supplies were heavy and the market price fell. On June 30, 1930, the Grain Stabilization Corporation held 57.4 million bushels of wheat. By the end of the year holdings were increased to 256 million bushels.³

Secretary of Agriculture Wallace attempted to use storage programs to reduce surpluses on the market and to improve the price. Acreage restrictions were also used.

At Bismarck, South Dakota, on June 6, 1934, Secretary Wallace said,

... Ordinarily we think of 120 million bushels of wheat as the normal carry-over; but if our foreign market (for) wheat does not come back, and production control continues to be necessary, the carry-over will have to be sufficient to insure us against crop failure.

... Perhaps it would be possible to set up a mechanism whereby growers could maintain these necessary reserves by means of loans, similar to the present corn and cotton loans. Stored commodities owned by producers and held in the country might be part of the system of

¹ Bruce, Andrew A., Non-Partisan League, New York: 1921, Macmillan Company, pp. 1, 2, 4.

² Dondlinger, Peter Tracy, The Book of Wheat, New York: 1910, Orange Judd Company, pp. 201, 209.

³ Davis, Joseph Stancliffe, Wheat and the AAA, Washington:

benefit payments in an adjustment program, the commodities stored in years of surplus to become available to farmers in lieu of benefit payments in subsequent years of production curtailment.¹

Fenton as an agricultural engineer gave the following advantages and disadvantages of farm storage:

Advantages of farm storage.

Marketing facilities are not always adequate at harvest. Modern harvests are short and rapid. Trucking costs to market may be high at harvest. Wheat may be separated and sold by qualities. Provides an opportunity to clean and condition wheat.

Disadvantages of farm storage.

Farm storage may require additional labor at harvest. Farm facilities for grain may not be convenient. Cost of farm storage is an added expense. There is some shrinkage in weight most years. Farm storage facilities may be in poor condition.²

The loan program in operation during 1950 caused some farmers to store on farms and some farmers to store in elevators. The low rate of interest paid by farmers with wheat under loan caused many farmers to store on farms and in commercial storage facilities.

Actually the world population could eat all the wheat grown but wheat is usually priced so high within a nation that its use is restricted to food use. In the United States the price is supported so high that other nations cannot afford to purchase the wheat unless given loans or other assistance. With

¹*Ibid.*, pp. 404-405.

²Fenton, F. G. "Farm Storage of Stored Wheat in Kansas", Thirty-third Biennial Report of the State Board of Agriculture, Topeka, Kansas: 1943, 38:90, 94.

free world trade, the surpluses so often found in the United States, Canada, Australia, and Argentina, would soon disappear through purchase or exchange.

Summary

The farmer who produces wheat will first tend to store to meet his food needs. He will then store to meet seed needs so he can produce wheat the following year. If there is still additional wheat the farmer will probably consider the physical and economic advantages of storing the grain.

Society through government may take the wheat through taxes or by confiscation and prevent the farmer from having wheat to store.

Grains under farmer control and in excess of current needs are probably stored on farm, in commercial storage, or sold depending upon financial need, physical convenience, and hope for financial gain through storage.

China may be cited as an example of a country where there is a shortage of food grains and therefore they do not have the same type of storage problem as found in surplus producing areas.

Russian farmers in many areas probably produce a surplus but government may not leave the question of storage practices to the judgment of the individual farmer.

In the United States the farmer with a surplus usually can make a choice as to the disposition of his wheat. There are factors which influence him but he has greater freedom of choice than is found in most areas.

MATERIALS AND METHODS USED

During the summer of 1950 the author asked 114 farmers in Ford and Thomas Counties where they preferred to store wheat. The reasons were obtained by survey-interview. Basic data concerning the individual farm storage facilities and storage operations was obtained by the interviewer. The reasons for farmer preferences were obtained to determine which factors are currently considered by farmers when deciding whether to store wheat on the farm or in commercial storage.

Farm bins containing wheat belonging to 28 different farmers were sampled at three different times to determine the extent to which quality problems arising from storage might influence the use of farm storage. Farm bins were sampled on the assumption that insect damage, or fear of insect damage, were major factors in causing farmers to use commercial storage facilities.

The factors found by survey-interview and those found through tests and checks on the bin samples were examined on the basis of other research to determine which should be of major importance to farmers and how such factors could be used to greatest advantage in planning to store on the farm or in commercial storage.

Areas in Kansas Studied

Ford and Thomas Counties were selected because of their importance as wheat producing counties in their respective parts of the state. Figure 1 shows the location of these counties.

Ford County and Thomas County have each ranked first in the production of Kansas wheat three times during the ten year period extending from 1941 through 1950. Ford County produced 52,735,000 bushels of wheat during the period and Thomas County produced 44,496,510 bushels of wheat during the period.¹ Both of these counties have large acreages suitable for extensive wheat production.

Ford County with an area of 693,120 acres had 1,231 farms in 1948 while Thomas County with an area of 684,800 acres had 703 farms.² On the basis of the number of farms in these counties in 1948, this survey included 5.7 percent of the Ford County farms and 6.3 percent of the Thomas County farms.

Within the counties several townships were selected at random and every available resident farmer was contacted. Each area was visited on two different days to allow two chances to contact the individual operators. The townships selected and the location of the farmsteads where operators were interviewed are shown in Figs. 2 and 3. Farmers were asked a series of questions related to their wheat storage problems and policies. In Ford County 70 farmers were interviewed while in Thomas County 44 farmers were interviewed. Only one farmer contacted refused to be interviewed.

¹"All Wheat--County Estimates, Acres Sown, Acres Harvested, Yield per Harvested Acre, Production", reports by the Federal- State Statistician, Topeka, for the years 1941 through 1950.

²Thirty-sixth Biennial Report of the Kansas State Board of Agriculture, Topeka, Kansas State Board of Agriculture, 1949, pp. 252, 388.

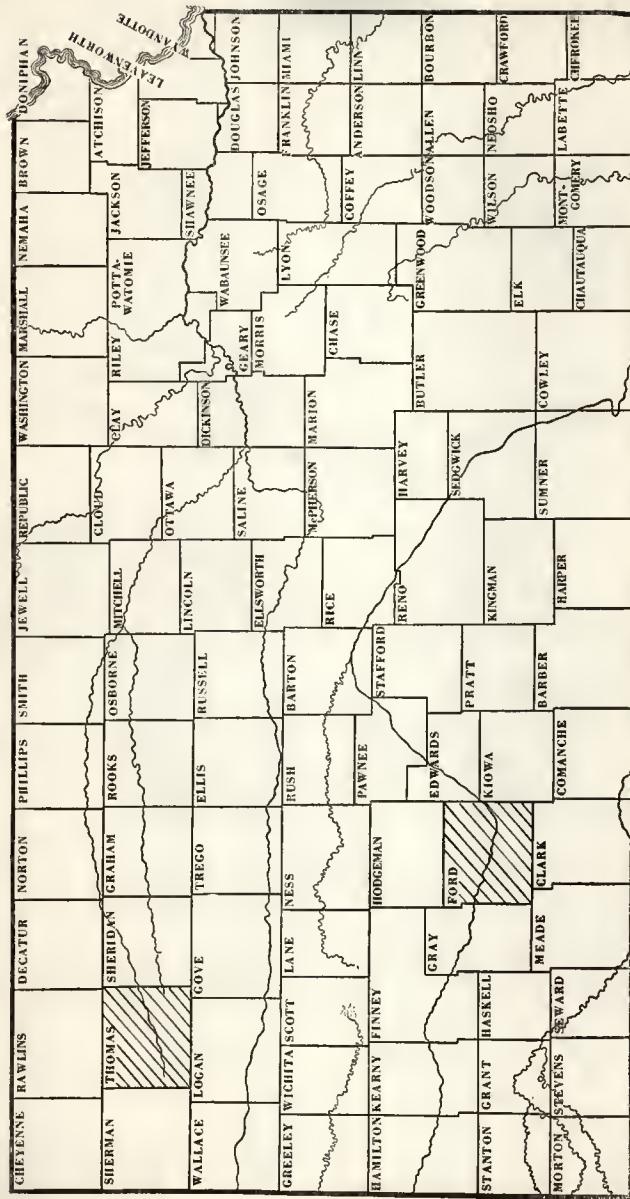


Fig. 1 Shaded areas indicate counties where farmers were interviewed.

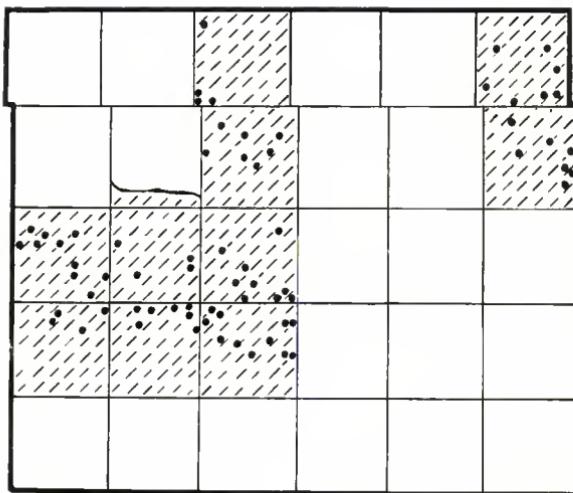


Fig. 2. Location of Ford County farmers interviewed and area surveyed. Shaded portion indicates area surveyed and dots represent the location of the farmsteads.

Scale: 1"=8 miles.

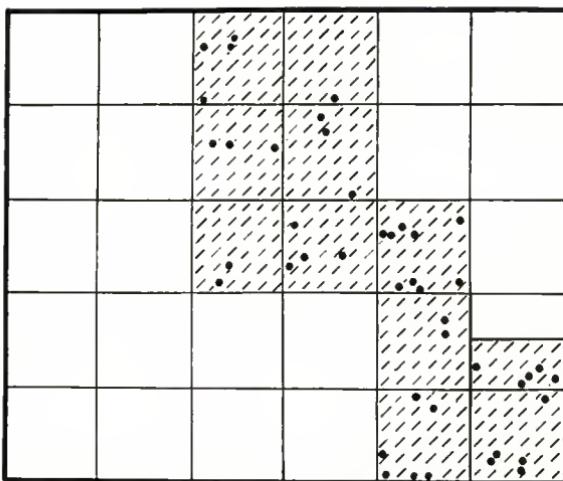


Fig. 3. Location of Thomas County farmers interviewed and area surveyed. Shaded portion indicates area surveyed and dots represent the location of the farmsteads.

Scale: 1"=8 miles.

Survey Questions

1. Do you store wheat?
2. If you store, do you prefer to store at the farm or in commercial storage?
3. What reasons do you have for such a storage position preference?
4. What determines which wheat is stored on the farm?
5. Was your crop average, above average, or below average this year?
6. Do you use the "government loan" or "purchase agreement" on the farm or in commercial storage?
7. Do you have criticisms which you feel could improve the support program?
8. When do you plan to sell wheat stored on the farm or that stored in commercial storage?
9. Do you have moisture tests, test weight, or other tests made on the wheat before it is placed in farm storage?
10. How much of an increase in the price of wheat do you feel would be necessary to pay you for storing wheat on the farm rather than to sell it at harvest? (Assume six months storage.)
11. How many acres of wheat do you plant?
12. What types of bins do you use?
13. What are the sizes and ages of these bins?
14. What is your favorite type of bin and why?
15. Do you use these bins for other uses?

16. Are the bins cleaned, sprayed, or given other treatment before filling?
17. What material was used if the bin was sprayed or fumigated and what amount was used?
18. Do you feel that you can maintain the quality of wheat during storage? (One year or less) (Market Grade)
19. Do you use an auger, blower, drag chain, cup elevator, or other mechanism to move grain into and out of bins?
20. Do you use a dryer?
21. Do you have a truck? What is the size?
22. How much does storage cost at your local elevator?
23. What is the distance to the nearest elevator and what type elevator is the nearest elevator?
24. What is the distance to the elevator used if this is not the nearest elevator? What type of elevator is the elevator used?

Determination of Deterioration in Storage

Permission was secured from 28 farmers to sample wheat in farm storage. The purpose of this phase of the study was to determine some of the quality changes which occur during farm storage and to study the reasons for these changes. The specific question under study was "How much influence do insects and other deterioration factors have in influencing farmers to store wheat in commercial storage facilities".

Since most of the farmers interviewed planned to market their farm stored wheat before January 1, 1951, plans were made to complete the series of bin samples before that date.

The August sampling included 29 bins of wheat. Only 22 bins of wheat remained for sampling in October, and by December only 19 were available for resampling. Those figures indicate that much wheat which farmers intended to hold until after January 1, 1951, was sown or sold before the intended date or was moved into commercial storage.

Samples were taken with a deep-bin type probe. This probe was a nine inch cup size with 125 gram capacity. Four three-foot sections of extension pipe provided sufficient length to sample all bins used in this study. A composite sample of approximately 2,000 grams was taken in the following manner.

The probe was pushed downward vertically into the wheat at a point about one foot from the outer wall of the bin on the side where the sampler was able to enter the bin. The first

probefull was obtained from just beneath the surface of the wheat. The second probefull was obtained by pushing the probe to a depth of two feet below the first probing. The vertical series of probings continued at two foot interval until the floor was reached. A second series of vertical probings was made in the center of the bin and additional complete series of vertical probings were made at intermediate points until a sample of approximately 2,000 grams was obtained.

The composite sample was placed in a plastic frozen food locker bag which was approximately 8.75 inches by 15 inches. This bag was gathered to exclude the air, was twisted tight and secured with a rubber band. The plastic bag containing the sample was then placed in a nine inch by 15 inch cotton bag and the cotton bag was tied. An identification tag was attached to the cotton bag.

The plastic bag was used as a liner to maintain accurate moisture content and to prevent insect movement into or out of the samples.

The samples were graded at the Kansas State Grain Inspection Office, Salina, Kansas. After grading, the remains of the samples were resacked and the insect counts were made at the Department of Entomology, Kansas State College, Manhattan, Kansas. The samples were sifted, using a size 12 screen, and the insects were counted and identified with assistance from staff members of the Department of Entomology.

STORAGE POSITION PREFERENCE OF FARMERS INTERVIEWED

During the summer of 1950 the author asked 114 farmers in Ford and Thomas Counties where they preferred to store their wheat. As could be expected, the expressed preferences differed with different farmers. These preferences are indicated in Table 1. In Ford County 68.6 percent of the farmers interviewed favored farm storage; 30.0 percent favored elevator storage; and 1.4 percent had no preferences. In Thomas County 79.5 percent of the farmers interviewed favored farm storage; 20.5 percent favored elevator storage and there were no farmers without a preference.

A number of reasons for preferring either farm or non-farm storage was listed by the 114 farmers interviewed. These reasons are summarized in Tables 2 and 3. Table 2 lists the reasons for preferring farm storage and Table 3 lists the reasons for preferring elevator storage. The author feels that many, if not most, of the explanations given by farmers are based upon custom, guess, or habit. Therefore, he has examined each reason in detail and analyzed its validity in light of existing knowledge. This analysis is presented in the pages immediately following Tables 2 and 3. In addition, samples of wheat were obtained from 29 farm bins in which wheat was stored in order to further verify the reasonableness of the farmers' answers. Details of this analysis are presented in another part of this thesis.

Table 1. Storage position preference of farmers by county.

Preference	Ford county		Thomas county	
	: Number	: Percent	: Number	: Percent
Farm storage	48	68.6	35	79.5
Elevator storage	21	30.0	9	20.5
No preference	1	1.4	0	0.0

Table 1 indicates the important position occupied by farm storage in the storage plans for the Ford and Thomas County farmers interviewed. Many farmers who preferred elevator storage were forced to store on the farm because the elevators were full or overcrowded during harvest and could not render the desired services.

Ford County farmers interviewed planted an average of 392.4 acres of wheat and lived an average distance of 6.2 miles from the nearest elevator. Thomas County farmers interviewed planted an average of 419.1 acres of wheat and lived an average distance of 6.2 miles from the nearest elevator.

REASONS GIVEN BY FARMERS FOR USING FARM STORAGE

The reasons given by farmers for preferring to use farm storage are examined in this section. The reasons are given in Table 2 and the discussion of the reasons follows the table.

Table 2. Reasons given by Ford and Thomas County farmers for preferring farm storage for wheat. (1950)¹

	Ford county : Number	Ford county : Percent	Thomas county : Number	Thomas county : Percent
Elevators full, crowded or farm storage is more convenient	31	44.3	18	40.9
Farm storage is a cheaper method	19	27.1	8	18.2
Store on farm to get price increase	9	12.9	12	27.3
Farm storage levels income tax	6	8.6	4	9.1
Farm storage acts as a reserve bank account	6	8.6	4	9.1
Farm storage acts as a reserve seed storage	4	5.7	2	4.5
Store on farm because loan price is higher than the cash price	2	2.9	0	0.0
Stored wet wheat not taken by elevator	3	4.3	1	2.3
Store to avoid high dockage at harvest or improve quality	1	1.4	3	6.8
Farm storage will help stabilize the wheat market	0	0.0	3	6.8
Farm storage permits personal care of wheat while in storage	0	0.0	2	4.5
Store on farm to draw loan payment for storage	2	2.9	0	0.0
Farm bins have other uses and wheat stored on the farm helps pay for buildings with other uses	2	2.9	0	0.0
Custom to store on the farm	3	4.3	0	0.0
Farm is the proper place or leaves wheat under own control	2	2.9	2	4.5
Certified seed requires separate storage	1	1.4	0	0.0

¹ Some farmers gave more than one reason thus a total of the percent of farmers giving each reason exceeds 100 percent.

Farm Storage Convenience

Full elevators, crowded elevator conditions, and the convenience of farm storage caused more farmers to prefer to store on the farm than any other major factor. For some of the farmers the term "farm convenience" was a relative term because the commercial facilities were overcrowded and could not handle the wheat.

In Ford County 44.3 percent of the farmers interviewed and in Thomas County 40.9 percent of the farmers interviewed gave the convenience of farm storage as a factor causing them to prefer farm storage. In Ford County 31.4 percent of the farmers interviewed and in Thomas County 34.1 percent of the farmers interviewed specifically mentioned the crowded unloading conditions at elevators or full elevators as causing farm storage to be more convenient than commercial storage.

Nearly one-third of the farmers interviewed were favoring farm storage because local commercial storage facilities were not meeting the storage demand of the farmers.

A survey conducted by the Kansas Agricultural Experiment Station in 1950 of 157 local elevators in Kansas showed that 128 or 81.5 percent experienced difficulty in getting sufficient railroad cars.¹ Since many small elevators depend upon volume

¹"Marketing and Pricing Techniques for Hard Red Winter Wheat at Local Elevators", Unpublished, Department of Economics and Sociology, Kansas State College, Manhattan, Kansas.

turnover rather than storage rental for income, there was an incentive to build larger storage type elevators under Commodity Credit Corporation storage provisions and rent storage space to obtain increased income. A total of 69 or 43.9 percent of the elevator operators wanted more storage space.¹ The desire for additional storage space and additional railroad cars indicated that there was a need for additional elevator service to handle the wheat crop. Thus results of this survey agree with the results of the interviews with farmers to show that many local commercial storage facilities are not providing services which meet the local storage needs.

The crowded condition at local elevators results from a large number of different factors. The use of the combine permits large acreages of wheat to be harvested within a short period of time and modern motor trucks traveling over improved roads are able to concentrate large quantities of wheat at the local elevators within a short period of time.

During recent harvest seasons, a great number of custom combines and trucks have followed the harvest and this causes even greater concentration of harvesting operations within a given area at a given time.

In the elevator study cited, the operators gave the railroad car shortage as their greatest problem in solving the congested elevator situation.² There has been a general shortage of railroad

¹²Loc. cit.

ears during wheat harvest since the beginning of World War II as compared to a greater supply during the 1930's when wheat crops were generally smaller and there was less competitive use for railroad cars.

Some elevator operators felt that there was a delay in shipping orders for wheat stored by the Commodity Credit Corporation and that these shipments competed with new crop shipments during harvest. Other operators were unable to secure sufficient ears to move wheat before harvest. A railroad strike affected railroad operations in both Ford County and Thomas County in 1950 as the Rock Island, one of the affected lines, served parts of these counties.

Many farmers felt that local elevators tried to keep sufficient quantities of wheat owned by the Commodity Credit Corporation in storage to assure the elevator that they would not have unfilled storage space if the local crop did not yield as much wheat as expected.

The western railroads often contend that eastern railroads do not return "rented" boxcars to the western railroads which own the cars. Such a condition would tend to prevent a seasonal shift toward concentration of railroad cars in the wheat belt.

A conference held in Topeka, Kansas, Saturday, March 10, 1951, called by Governor Edward F. Arn of Kansas and attended by 30 representatives from six states established a grain states compact commission on transportation. This commission would include the governors of all states joining plus two additional

representatives. One appointed representative would be familiar with transportation facilities and the other familiar with shipper interests. This conference agreed to the following plan:

(1.) Ask the Defense Production administration to restore promptly sufficient allocations of steel to build at least 12,500 new boxcars a month.

(2.) Request Interstate Commerce commission and the Defense Transportation administration to order return to western lines of enough cars to give them full use of the cars they own.

(3.) Ask Congress for legislation empowering the ICC on its own initiative to increase the \$1.75 a day rental charge on borrowed cars to such a rental charge as will result in return of the cars to lines which own them.

(4.) Request the Association of American Railroads to increase transportation efficiency by expanding the loading, unloading and return to use of boxcars.

(5.) Request the Association of American Railroads and the Defense Transportation administration to station one or more representatives in the grain belt states to receive complaints from shippers and expedite distribution of available cars on a nondiscriminatory basis.

(6.) Ask the Defense Transportation administration or such other agency as may have power to require that when ships are available for loading, cars shall be unloaded at ports on a 24-hour basis.

The conference agreed to send its proposals to members of Congress from the grain belt states, presidents of class 1 railroads of the western district and various government agencies addressed.

The grain states commission as formed include representatives of Kansas, Colorado, Iowa, Oklahoma, Missouri and Nebraska. Wyoming, North Dakota, South Dakota and Minnesota also will be invited to join the commission.

The group agreed that railroads just don't have enough boxcars to meet the demand, but declared the situation is aggravated by the large number of western railroad cars retained by eastern carriers.¹

¹Kansas City Grain Market Review, Monday, March 12, 1951.

If additional railroad cars could be made available, many elevators would be more able to handle the grain which could be delivered to them. Since ears have not been available and since local elevators have been able to pay for new storage space by storing wheat for the Commodity Credit Corporation, many have increased storage space and some new elevators have been built. Many farmers complained that the increased storage space has been ineffective in meeting the need because it has often been partially filled with old crop wheat and was not available for storage of the new crop.

If sufficient boxcars could be made available; if existing elevator space could be more effectively used to handle the new crop; or if the wheat crops become smaller it would follow that the situation which these farmers faced could be relieved. If such relief does not solve the problem, increased use of farm storage would be desirable although not free from criticism.

Farm Storage is Cheaper

In Ford County, 27.9 percent of the farmers interviewed believed farm storage cost less than commercial storage. Only 18.2 percent of the Thomas County farmers interviewed felt that farm storage was cheaper.

Farmers tend to consider only out-of-the-pocket costs when estimating farm storage costs so actually the cost may often be higher than most farmers realize. The interviewer asked the farmers the question, "What is the charge for commercial storage

at your local elevator"? Only 40 percent of the Ford County farmers interviewed gave an answer to the question. Many of the answers were not specific. A typical answer was, "I think it runs about a cent or a cent and one-half per bushel per month."

This survey indicated that although many farmers feel farm storage is cheaper, few actually know the exact cost of commercial storage at their local elevator. An example from the survey follows. In Ford County 16 farmers used the same elevator for sales and commercial storage if commercial storage was used.

Although these 16 farmers actually used the same elevator and were part owners in the enterprise, eight different cost figures were given by the farmers as the cost of elevator storage. There were seven farmers in the group who did not know or did not give a storage cost for elevator storage. The answers given included the following: One cent per month; 14 cents for the year; one and one-half cents per month for nine months; one and one-half cents per month for seven months; one cent per month for the first three months then one-half cent per month; and 11 cents maximum for the year. Three of the 16 farmers using this elevator felt that farm storage was cheaper than the cost of elevator storage. Two of the three did not give a cost of storage figure for commercial storage and the third believed the cost to be 14 cents per year.

There are variations in the charges for storage at local elevators but this figure probably does not vary as much as the cost of farm storage.

Each farm storage situation presents a different storage cost problem. Even the most accurate cost analysis may be made obsolete by a change in storage plans. Any cost study made during the life of a storage unit is based on the assumption that the future storage plans will follow the pattern considered.

Under current conditions the highest costs for farm storage should be found on farms where new storage facilities must be constructed and the lowest cost found on farms where there is good low cost unused storage space available.

The Farm Credit Administration in cooperation with Oklahoma A. & M. College calculated the cost of new storage in Oklahoma for the 1947-48 storage year at 15.8 cents per bushel. Since only 41 percent of the storage space was used on the farms surveyed in Oklahoma the actual cost per bushel stored would have been 22.2 cents per bushel. If good unused space was available the total cost was reduced to 11.4 cents per bushel. This cost exceeded the commercial rate by about one cent.¹

In calculating the cost per bushel per year in the case of new storage in Oklahoma, two 1,000 bushel steel bins and a mechanical conveyer or loader were considered as the equipment investment. Fixed costs included interest, depreciation, insurance, and taxes. Variable expenses included shrinkage, insurance on grain, treating, turning and conditioning, cost of lower grade, risk and inconvenience, and extra transportation

¹ Hall, Thomas E., and others, Where and How Much Cash Grain Storage for Oklahoma Farmers, Farm Credit Administration, Bulletin 58, May 1950, pp. 20-21.

and labor expense.¹

The Ford and Thomas County farmers interviewed had storage units averaging nearly 10,000 bushels. Farmers with these large units would have smaller fixed costs per bushel than the figure calculated for the 2,000 bushel unit in the Oklahoma study.

Green calculated the 1920 costs for farm storage as 1.7 cents per bushel per month for Eastern Kansas and 1.4 cents per bushel per month for Central and Western Kansas.²

A release from the Federal Farm Board, April 3, 1930, showed a calculated cost for farm storage of 5.2 cents per bushel per year for wheat storage.³ Although this cost is much below 1950-1951 cost because of a general price increase by 1950, it does indicate that farm storage facilities which were built when the costs were low can probably provide cheaper storage much cheaper than new storage facilities. Between 20 and 25 percent of the Ford and Thomas County farm bins on farms where the farmers were interviewed were on the farm before 1930. Thus the original investment on some storage units existing today is low as compared to current investments for new units.

The interest rates on investment were eight percent as calculated for the cost issued by the Federal Farm Board while only four percent in the Oklahoma study. The life of a bin was

¹ Ibid., pp. 11, 20.

² Green, R. M., Farm Storage as a Factor in the Marketing of Kansas Wheat, Kansas Agricultural Experiment Station Bulletin 229, November 1922, p. 32.

³ Bell, E. J., Jr., Federal Farm Board Release, Information Division, No. 25, April 3, 1930, p. 4.

was estimated to be 10 years in the calculation of the cost issued by the Federal Farm Board while in the Oklahoma study the average life of a bin was estimated at 25 years.

The average age of all types of bins used by the farmers interviewed in Ford and Thomas Counties was approximately 15 years. The only exception was the case of the steel building type bin.

Some farmers are able to use storage space for wheat during part of the year and for other enterprises during the remainder of the year. In such cases the fixed costs would be reduced for the wheat storage.

Cost of storage figures for farm storage usually represents an average for a group of farms. For some with high fixed costs and inefficient methods the cost is above an average and there would be an advantage to use elevator storage. Other farmers with low fixed costs and efficient methods can store for a cost less than the average and therefore the advantages if any of elevator storage would be reduced.

Existing farm storage should be used in the most profitable way whether it be used for wheat storage or for other uses. New storage should be restricted to farms where there is a definite need or where cost studies show that the proposed storage plan will pay.

Some farmers are not able to get their wheat into commercial storage even when they desire commercial storage. When wheat must be stored on the farm every attempt should be made to reduce the cost of storage as such attempts can increase profits from the wheat enterprise.

Store on Farm to Get Benefit of Price Increases

Many farmers feel that seasonal price variations make farm storage profitable. Unless other factors make farm storage desirable any seasonal price increase could be obtained for wheat stored in commercial storage as well as for farm stored wheat. In Ford County 12.9 percent of the farmers favored farm storage to get price increases while in Thomas County 27.3 percent of the farmers interviewed favored farm storage for that reason.

Green studied seasonal fluctuations of wheat prices for a 32 year period (1892-93 to 1923-24). Periods of weakness included the June, July, and August periods when prospective and actual new crop movements influence the market. November weakness was influenced by movement of Canadian wheat and spring wheat from northern areas. February and March weakness was influenced by movement of Argentina and Australian wheat. Periods of strength included September and October, January, and April. Frozen conditions tended to prevent Great Lakes shipping and often helped strengthen the January price. In April the lakes were often closed and farm wheat was often sold out.¹

Working concluded from his studies that farm storage would yield a profit during certain years but that a policy of storing the same amount each year was unprofitable. His study covered

¹Green, R. M., Seasonal Fluctuations of Wheat Prices, Kansas Agricultural Experiment Station Circular 121, December 1925, p. 10.

the years 1899-1900 to 1913-14, and 1921-22 to 1927-28. In regards to a farm storage policy Working said the following:

These data indicate that under a policy of storing the same amount of wheat each year, even farm storage, with its relatively low costs, may be expected to prove unprofitable for both No. 2 Hard Winter and No. 1 Northern Spring wheat. They suggest, however, that with intelligent selection of the years in which to store heavily, farm storage should return a modest profit.¹

Seasonal price rises in Oklahoma have not indicated that farmers should store wheat. Ellis said,

An analysis of the monthly Oklahoma farm price of wheat for the period 1910-1934 indicates that it has normally been more profitable to sell wheat at harvest time.

The average monthly price rise was less than one cent per month.²

The index of average seasonal variation of prices of top and low No. 2 Hard Winter Wheat, Kansas City, Mo., 1919-41 was calculated by McCoy at the Kansas Agricultural Experiment Station. The index for top No. 2 Hard Winter Wheat by months was as follows: January-102.6, February-101.7, March-100.5, April-101.1, May-103.0, June-100.5, July-100.3, August-96.1, September-98.3, October-98.1, November-97.6, and December-100.2.³ For low No. 2 Hard Winter Wheat the seasonal index by months was as follows:

¹Working, Holbrook, "The Post-Harvest Depression of Wheat Prices IV--Potential Gains From Farm Storage", Wheat Studies of The Food Research Institute, Vol. 6, 1930, Stanford University, p. 30.

²Ellis, Lippert S., Current Farm Economics, Oklahoma A. & M. College, June, 1935, Vol. 8. No. 3, p. 53.

³McCoy, John H. Index of Average Seasonal Variation of Price of Top No. 2 Hard Winter Wheat, Kansas City, Mo., 1919-41 Unpublished, Dept. of Economics and Sociology, Kansas State College, S-1274-6.

January-103.4, February-102.2, March-101.0, April-103.1, May-104.2, June-100.2, July-96.3, August-94.5, September-98.9, October-97.1, November-98.2, and December-100.9.¹

Seasonal prices in North Central South Dakota for the period 1890-1940 indicated that seasonal gains for wheat were small. Peterson said,

In the case of neither wheat nor flax does the seasonal appear large enough to justify increased storage operations by farmers if this involves building additional storage capacity. Where finances and existing storage capacity permit, however, it may prove profitable to hold these grains for several months (normally about five) and then sell at a seasonably higher price.²

Thus it would appear that in the long-run there is little to gain through price increases by planning to store on the farm. There are many exceptional years but it is difficult to choose the profitable storage years.

Store on Farm to Lev'l Income Tax

In Ford County 12.9 percent of the farmers interviewed favored farm storage because they felt that it helped to level income tax payments. Only 9.1 percent of the farmers interviewed in Thomas County gave this reason. Heavy January wheat marketings of Kansas wheat in 1943, 1945, and 1946 indicates that many

¹McCoy, John H., "Index of Average Seasonal Variation of Price of Low No. 2 Hard Winter Wheat, Kansas City, Mo., 1919-41, Unpublished, Dept. of Economics and Sociology, Kansas State College S-1274-1.

²Peterson, Weber H., Wheat and Flax Prices Received by Farmers in North Central and North Eastern South Dakota 1890-1900, 1942, Agricultural Experiment Station Circular 35, South Dakota State College, p. 4.

farmers probably held wheat over until after the first of the year to level their income tax payments.

Variation in wheat production, other income, deductible expenses, and possible changes in tax regulations make accurate estimates of taxable income for the following year difficult to determine. Many farmers who hold over wheat to level their income often have a higher taxable income the second year and perhaps a higher tax rate so they pay greater taxes by holding wheat.

A good farm budget planned at least a year in advance will give a rough indication to a farmer of prospective income for the following year. With this guide there may be individual cases where there are definite advantages in the form of tax savings through storage to level the tax. Such a farm budget might also indicate to many farmers that their prospective income is greater than the present and that it might be unwise to store.

Without a budget or other estimate as to the possible future tax, storage to level income tax would be a case of speculation by the farmer.

Unless there are other factors which make farm storage desirable there would be no income tax leveling benefits through farm storage which could not be obtained through use of commercial storage.

Farm Storage as a Reserve Bank Account

In Ford County 8.6 percent of the farmers interviewed stored wheat on the farm because they felt that farm stored wheat was like a reserve bank account. Only 9.1 percent of the Thomas County farmers interviewed gave this reason.

There have been periods when banking facilities and credit facilities were not stable. Many farmers remember bank failures during the 1930's before the banking system was stabilized by the Federal Deposit Insurance Corporation and other banking regulations.

When banks failed it is possible that wheat in a bin was more secure than money in a bank. Some farmers held their wheat and later sold it for a good profit. Although wheat is storable it is not as durable as the metals upon which most money systems are based.

Current regulation of banking facilities by the federal and state governments plus the influence of the Federal Reserve System and the Federal Deposit Insurance Corporation have greatly reduced the risk of loss from bank failure. Section 3, (2) of the Federal Deposit Insurance Act, Public Law 797 (S. 2822) approved September 21, 1950, provided for an increase from \$5,000 to \$10,000 in the maximum coverage per depositor.¹

¹Summary of Federal Legislation Affecting Banking, 81st Congress, Committee on Federal Legislation, American Banking Association, New York, January, 1951, Sec. 3 (2) Public Law 797.

Some farmers feel that if they store wheat on the farm rather than to sell wheat and place the money in a bank they save more money. They feel that they are frequently guilty of writing checks without much thought while they are more reluctant to spend money if they must first sell wheat.

A good system of farm accounting which would provide adequate information for a budget should provide a more practical guide to the use of assets. However, variation in the price of wheat makes budgeting difficult as assets increase or decrease with the price of wheat.

Barber at the Kansas Agricultural Experiment Station made a study of ways to meet weather risks in Kansas wheat farming. He assumed storage facilities for 5,000 bushels of wheat on a 605 acre farm with 231 acres of wheat. He used long time prices and costs covering the 1915-48 period and compared net income for farmers who sold their wheat with net income for farmers who used a reserve storage plan. He assumed that wheat would be withdrawn from storage when net income fell below the estimated farm family living expenses and that a surplus would be stored when net income exceeded the estimated family living expenses. This research study showed that the yearly average net income of the farmer using storage as a reserve was approximately \$70.00 less than the average net income for the farmer who did not store commodity reserves. This did not include any savings in income tax. Storage cost was given as

one reason for the reduced net income through farm storage.¹

In discussing commodity reserves Barber said:

As a financial asset, it is less liquid than cash in the bank or bonds as its value may be depreciated both by falling prices and physical deterioration. Also, holding physical reserves of grain involves a storage cost and only a speculative prospect of gain.²

There are times when a reserve storage of wheat could protect the owner from the full effects of inflation. In time of inflation the purchasing power of monetary savings is reduced. During such times the price of wheat in storage should normally rise to some higher level. Thus the return from a bushel of wheat under such conditions would buy more goods and services than could be purchased had the wheat been sold before the inflation and the return deposited in a bank. There is also the reverse situation where the price of wheat may drop and the purchasing power of the dollar may rise.

Farm Storage as a Reserve Seed Storage

Some farmers feel that they should store seed wheat to have a seed reserve. In Ford County 5.6 percent of the farmers interviewed, and in Thomas County 4.5 percent of the farmers interviewed, felt that farm storage was desirable because it provided a seed reserve.

¹Barber, E. Lloyd, Meeting Weather Risks in Kansas Wheat Farming, Agricultural Economics Report No. 44, Kansas Agricultural Experiment Station, September 1950, pp. 16-17.

²Ibid., p. 16.

These farmers gave high prices paid for seed wheat as the major reason for desiring farm storage of wheat as a seed reserve. They also mentioned the advantages of keeping certified seed and other seed wheat free from weeds stored separate from inferior seed.

Ford County has extensive infestation with rye and joint-weed or goat-grass. These create a marketing and seeding problem. A farmer who has used good farming practices to rid his fields of these weeds and other grains usually does not want to reinfest his fields by being forced to buy seed wheat containing such undesirable seeds. The Thomas County farmers do not have as wide an infestation of rye and joint-grass as is found in Ford County. More extensive use of summer fallow in Thomas County may be one of the reasons for this difference.

Although extreme shortage of seed wheat may exist on the individual farm, this condition usually is modified as a larger area is considered and the risk is spread over many farms and reaches beyond the small areas so often damaged by hail or suffering other losses.

The individual farmer who does not have seed wheat to sow may face situations involving extremely high prices, low quality seed wheat, undesirable variety, wheat containing weed seeds, damaged seeds, mixed grains, and low germination. If the farmer grows and stores his own wheat for seed he is in a position to know the general qualities of the seed while those forced to buy seed either assume risk as to the quality or they pay for

protection offered through certification or other guarantees.

All of the farmers interviewed stored seed wheat unless they had plans to change varieties or to obtain new seed of the same variety. If the farmer stores good, sound, dry wheat at harvest it is not difficult under good storage conditions to maintain the general quality of the wheat until seeding time in the fall. However, if the farmer desires to store seed wheat as a seed reserve, he assumes increased risks as the length of storage is extended. Possibility of damage by insects and rodents is greatly increased and heat damage and moisture damage may also be increased if the storage period is extended.¹

The importance of seed storage in Kansas is indicated by the fact that about 13,340,250 bushels or about 8.3 percent of the average annual production in Kansas for the period 1926-1950 was utilized for seed on the farm where grown. The smallest quantity seeded from farm storage during this period was 10,742,000 bushels in 1942. The largest quantity seeded during the same period was 17,111,000 bushels in 1936. The storage of seed wheat constitutes an important part of all farm storage. Storage figures available show an average of 22,567,540 bushels of farm stored wheat was used by Kansas farmers for feed, seed, and home use during the period 1926-1950. This figure represents nearly one-third of the average amount of wheat held in farm

¹Fenton, on. cit., pp. 92-104.

storage on October 1.¹

Farm storage of seed wheat as a seed reserve on Kansas farms has several advantages and several disadvantages which may be briefly listed as follows:

Advantages

- A reserve seed supply provides seed of known quality.
- A reserve seed supply provides seed at a reasonable price when good seed is scarce and prices are high.
- The seed reserve is available when needed and on the farm where needed.
- Many farmers utilize spare time to clean their seed.
- A reserve seed supply reduces the chance of obtaining rye, weed seeds, or other undesirable qualities through purchase of seed from outside sources.
- Cleanings from seed wheat can often be utilized for livestock feed.
- Seed reserves can help stabilize agriculture in an area.

Disadvantages

- Seed wheat must be stored only in a dry, sound condition.
- Seed wheat must be kept dry while in storage.
- Seed wheat must be kept free from insects and rodents.
- Reserve seed storage involves financial risk not carried by the farmer if he does not maintain a seed reserve.

Other Reasons

Several other factors were considered by farmers as reasons for preferring farm storage for wheat.

Loan Price Above Cash Price. In Ford County two farmers favored farm storage because the loan price was above the cash price. If these farmers desired a loan but did not have other reasons for storing on the farm, they could obtain a loan on wheat

¹Kansas Crop and Livestock Statistics, 1949, Annual Summary,
Kansas State Board of Agriculture, Vol. 69, 1950, pp. 23, 36.

stored at a local elevator and shift the storage risk.

Unless some other factor showed farm storage to be favored over commercial elevator storage there would appear to be no apparent advantage to store on the farm simply because the loan price was higher than the cash price.

In both cases involving these Ford County farmers, there were other reasons which influenced the farmer to use farm storage. One also favored farm storage because of relative convenience while the other felt that farm storage also acted as a reserve bank account.

Stored Wet Wheat Not Taken by Elevator. In Ford County three farmers interviewed stored wheat on the farm because the local elevators would not accept wheat which had moisture above a level determined by the elevator operator. In Thomas County one farmer gave the same reason. Many elevators in 1950 refused to store wheat above 14 percent moisture but would buy the wheat at a discount if they could get railroad cars.

Under normal conditions, elevators are able to move wet wheat and do sufficient mixing to keep it from showing excessive damage. During wet harvest seasons or when local elevator facilities are full or nearly full, the amount of wet wheat which will be accepted is limited. Under such conditions, price discounts may be high for wet wheat and the elevator may refuse to accept wheat with moisture above a given level.

Discounts for "Tough" wheat at Kansas City during July and August, 1950, were generally listed as one cent discount for

each one-fourth percent moisture over 1 $\frac{1}{4}$ percent. On July fifth and seventh, the listed discounts were one-half cent discount for each one-half percent moisture over 1 $\frac{1}{4}$ percent. On July 21 and 22, the discount was one cent for each one-half percent moisture over 1 $\frac{1}{4}$ percent.¹

These terminal market discounts tend to discourage handling of wet wheat by the local elevators. The local elevator operator will attempt to protect himself from losses through such discounts by discounting the wheat which he purchases.

Usually wet wheat which is not accepted by a local elevator is not in condition to be safely stored on the farm. If the farmer does not provide extra care and treatment for such wheat he may suffer losses during storage.

Competition between elevators is such that usually wheat which is in a storable condition will be accepted by the elevator unless the elevator is full.

Many elevator operators feel that farmers could improve the wet wheat problem if they would let the wheat stand until it is ripe and ready to combine. Many farmers argue that they prefer to take a discount rather than to take the risk of losing the entire crop by additional rain, hail, weeds, wind, etc. If farmers desire to deliver wet wheat to the markets then they must be willing to accept fair discounts for wheat which cannot be stored without damage.

¹Kansas City Grain Market Review, July-August, 1950.
Calculated from daily discounts as listed.

Improved crop insurance may prove to be a partial solution to the problem of the farmer who cuts wheat while green because he is afraid of total loss if he allows the crop to stand.

Only one farmer interviewed had a dryer. This was actually only a blower to force air through the bin of wheat. During dry weather such a mechanism could force dry air through the wheat but if the air is damp little drying can be accomplished with such a machine. Dryers, economical in operation and capable of producing dry air when needed, may be a possible answer to the wet wheat problem.

Store to Avoid High Dockage at Harvest or to Improve Quality.

In Ford County one farmer interviewed preferred farm storage to avoid high dockage at harvest or to improve the quality of the wheat. This is an individual problem and usually does not exist unless the wheat is off-grade or in such a condition that it cannot be effectively handled or safely stored at harvest.

This problem is similar to the one arising because the local elevator would not accept wet wheat. It will be considered separately here because it includes not only wet wheat but wheat which for a great number of reasons may not grade high enough to be handled without discount.

In Ford County many farmers have excess rye in the wheat. The elevators do not always have an extra bin to hold this off-grade wheat and is often too busy to take the necessary time to handle the off-grade wheat separately. Therefore, the wheat is heavily discounted because the elevator is not in a position to

handle the wheat as it should be handled. If the farmer can store such wheat until after harvest is over the elevator operator can then often handle the wheat as a separate lot and pay the farmer a better price than would have been possible at harvest.

Discounts for rye during the 1950 harvest season at local elevators were frequently one-half to one cent for each percent of rye. Some elevator operators picked the rye from a known sample and weighed the rye. Others simply measured out a thimble or other small container full of wheat and counted the rye kernels.

Small quantities of off-grade wheat may be given special care and in some cases improved so that it will demand a higher price. Most farmers do not care to devote the extra time and effort necessary to move, clean, or mix wheat to avoid the discounts by local elevators. Usually unless the elevator is not able to handle the wheat the price will be discounted to cover the risk. Some elevator operators indicated that they may over bid competition for good wheat but seldom reduce discounts on poor wheat because they do not desire to attract that quality of wheat to their elevator.

Farm Storage Will Help Stabilize the Wheat Market. In Thomas County three farmers felt that farm storage would help to stabilize the wheat market. Since wheat production is an industry composed of many producers, the effectiveness of farm storage in stabilizing the market depends in part upon the extent of the movement among wheat farmers since no one farmer or small

group of farmers can exert sufficient influence to change the market price.

Many groups have tried to store various crops to force the market upward. When prices are favorable most farmers do not care to resort to such measures. When prices are unfavorable and farmers often form pools or attempt to hold the product from the market, the individual farmer is often not in a financial position to hold the product over a long period of time and therefore cannot continue to hold the product from the market.

Although wheat is a storable commodity, variation in weather and other production factors from year to year often influence yield to such an extent that planned storage may become ineffective in providing a more uniform supply of the commodity for the market each season.

Green reported that marketings after harvest showed a tendency to depress the market about four to five cents.¹ However, he pointed out that other factors were also important in causing this seasonal decline. Green said,

The danger of losses through excessive moisture, weevil infestation, etc., under certain harvesting conditions, together with sudden advances in wheat prices, are other important factors contributing to heavy seasonal movements of Kansas wheat, and seem to account for one-third to one-half of the early movement of wheat to market.²

¹ Green, R. M., The Effects of Shortage of Farm Storage Space and Inability to Get Local Bank Credit on the Movement of Kansas Wheat to Market, Kansas Agricultural Experiment Station Bulletin 244, November, 1927, p. 25.

² Ibid., p. 3.

Shepherd summed up the effects of storage programs on price by saying,

Storage programs, which merely put products into storage at one time and take them out at another, can stabilize prices but cannot raise their level over a period of years.¹

A storage program to be effective in stabilizing price must be planned to supply wheat to meet market demands. An ineffective storage program not geared to meet market demands might increase price fluctuations.

Farm Storage Permits Personal Care of Wheat. In Thomas County two farmers felt that farm storage permitted personal care of the stored wheat. Personal care of farm stored grain involves increased responsibility and effort on the part of the farmer to prevent damage and deterioration. Most farmers are not equipped with storage facilities as adequately as are commercial elevators to handle the wheat. This condition requires extra care by most farmers to maintain quality equal to that which could be maintained in commercial storage.

Both of these farmers had at least one other reason for preferring farm storage so it is possible that the other reason was dominant. One of the farmers also felt that farm storage cost less than elevator storage. The other farmer felt that farm storage gave the farmer greater control over the wheat and that farm storage helped level income tax.

¹Shepherd, Geoffroy S., Agricultural Price Control, Ames, Iowa, 1945; Collegiate Press, p. 346.

If those farmers who feel that farm storage permits personal care of the wheat can exercise sufficient care to help improve the quality of wheat delivered to commercial facilities from farm storage, they would be contributing to the improvement of the wheat industry.

Since some seasons present situations requiring that much wheat be stored on farms, such an attitude of improved personal care on the part of all farmers could prevent much of the heat damage, moisture damage, insect damage, and other types of deterioration and damage so often found in improperly stored farm grains.

Although only two farmers gave this reason as a reason for preferring farm storage, many farmers who store on the farm realize that good care pays in the form of better market grades when the wheat is removed from storage and sold.

Store on Farm to Draw Loan Payment for Storage. In Ford County two farmers favored farm storage because they could draw the loan payment. This attitude would indicate that these farmers felt that farm storage was cheaper than elevator storage after the loan payment was considered. The interviews with the farmers indicated that farmers tend to consider only cash expenses as storage costs and often consider payments for storage of grain on the farm as net income from storage.

No other reason was given by one of the farmers for preferring farm storage while the other also preferred farm

storage as a reserve seed storage and to gain price increases.

Farm storage to draw loan payments for storage is considered in greater detail in the discussion of the next factor. Changes in the rate of payment for farm storage and termination of these payments create a situation which should demonstrate the unsoundness of building new storage facilities and depending on storage payments to help pay for the new structure unless these payments are guaranteed.

Farm Bins Have Other Uses and Wheat Stored on the Farm Helps Pay for Buildings with Other Uses. In Ferdinand County two farmers felt that wheat can be stored on the farm and because of the low cost storage can help pay for the storage facilities. Later these facilities may be used for other uses, or wheat and other enterprises may share the storage facilities by using the facilities at different seasons of the year.

Some farmers who erected steel type building for use as machine sheds and livestock shelters used these structures for wheat storage during several storage seasons and felt that the storage payments received helped pay for the building. Accurate cost studies probably would have shown that the return was smaller than the farmer considered it to be. Many structures which would be adequate for livestock or machinery are not satisfactory for grain storage.

Unless future storage payments are guaranteed, a farmer cannot plan to build new storage and expect these payments to pay for the building. Unless the farmer can show that his costs

of storage on the farm are less than those charged at local elevators, he may burden other enterprises with high fixed costs by building dual purpose structures which are more expensive than would be needed by other enterprises which share the structure with wheat.

Custom to Store on the Farm. Farm storage was preferred by three Ford County farmers because they considered farm storage as a custom. Although no specific values can be placed on this factor, it probably exerts greater influence to continue farm storage than some of the factors expressed more frequently by farmers.

During earlier times much farm storage existed because the distance between the farms and the elevators were too great to permit immediate hauling of the wheat from the threshing machine. Improvements in roads, transportation, and in some areas additional elevators have reduced the distance factor and made it less important for most farmers. Although the importance of distance has been reduced, farmers are reluctant to change storage plans in some communities because farm storage is a custom and facilities are available on the farm.

Farm is the Proper Place. In Ford County two farmers preferred farm storage because they said the farm was the proper place or that wheat was left under their own control. In Thomas County this reason was also given by two farmers. These farmers felt that when wheat was removed from the farms to commercial

storage that the farmers did not have the same degree of control over the wheat that was exercised if the wheat remained stored on the farms. Wheat in commercial storage remains as property of the person who places the wheat in storage and this person can designate the date he desires to sell his wheat. Usually the identity of the particular lot of wheat is lost and the farmer simply retains title to a given number of bushels of wheat of a certain quality. Risk is shifted to the commercial storer if a warehouse receipt is issued.

Since wheat stored in commercial storage is stored on a grade basis; if the farmer should desire to take wheat from storage and use it for feed or seed, he would be able to obtain only wheat of a certain grade rather than his own individual lot of wheat. In the case of seed wheat there would be loss of control if the farmer desired his particular lot of wheat. This situation was not suggested by any of the four farmers who preferred farm storage to retain greater control over their wheat.

These four farmers did express the feeling that if all farmers would store on the farm that the farmers could control the wheat market. The individual farmer or a small group of farmers in the competitive wheat industry have little if any influence on the market price of wheat. Such group action in the past has not secured the results desired by the organizers.

Certified Seed Requires Separate Storage. In Ford County one farmer who produced certified seed wheat favored farm storage of wheat because demands for this product require that it be of known quality and purity. Since this product must be stored without being mixed with other wheat or other grains, commercial elevator storage usually is not desirable. Since the product is more valuable than the market grades of wheat, the farmer can afford the necessary facilities to maintain the purity and identity of the seed.

This farmer favored elevator storage for his market wheat but found it unsuitable for his certified wheat crop. Thus certified seed production under most conditions will demand farm storage during the harvest rush and perhaps for the entire season of storage which normally is for only a short time. When certified seed is placed in farm storage the farmer should attempt to provide the needed storage at the lowest cost since this will increase his profits from his certified seed.

REASON GIVEN BY FARMERS FOR USING ELEVATOR STORAGE

The reasons given by farmers for using elevator storage are shown in Table 3 and a discussion of the validity of these reasons follows the table under individual headings.

Table 3. Reasons given by farmers for preferring elevator storage of wheat.¹

Reason	Ford county		Thomas county	
	: Number	: Percent	: Number	: Percent
Farmer gets the benefit of shrinkage	8	11.4	7	15.9
Elevator storage reduces loss. (Fire, weevil, rodents, wind, and theft)	10	14.3	3	6.8
Elevator storage is more convenient	8	11.4	0	0
Farm bins not in physical condition to store wheat	4	5.7	2	4.5
Wheat is easier to sell from elevators	3	4.3	0	0
Elevator storage leaves farm bins free for other uses	1	1.4	1	2.2
Additional cost if government loan is taken on farm stored wheat	1	1.4	0	0
Government loan might tie-up farm bins	1	1.4	0	0
Cheaper to haul to the elevator at harvest	0	0	1	2.2

¹ Two Ford County farmers and one Thomas County farmer are not included in either the group with reasons favoring elevator storage or with the group with reasons favoring farm storage. The two Ford County farmers sold their wheat directly to the elevator at harvest and had no reasons for storage preference. The Thomas County farmer gave no reason for not having a preference. More than one reason was given by some of the farmers.

Farmer Gets the Benefit of Shrinkage

In Ford County 11.4 percent of the farmers interviewed preferred elevator storage because they felt that the farmer got the benefit of shrinkage when commercial storage was used. In Thomas County 15.9 percent of the farmers interviewed gave this preference.

The interviewer found that the average farmer had no accurate method of estimating shrinkage. Those few with accurate means of measurement tended to give a much smaller shrinkage figure as compared to those without accurate means of measurement.

One large operator interviewed had equipment to weigh, test for moisture, and weigh for test weight. His wheat was weighed before storage and again after being removed for shipment. His total loss did not exceed one percent on dry wheat containing not over 12 to 12.5 percent moisture.

Typical estimates by those who felt shrinkage was high during farm storage made such estimates from the observation that a truckload of wheat at harvest contained a greater number of bushels of wheat than a similar truckload of wheat from a farm bin later during the season. Of course there is no accurate measurement under such conditions to show whether the loads were of comparable size. A few farmers suggested that perhaps during the rush of harvest, farmers may tend to pile on a little more wheat than they do later when hauling from the farm bin.

In Oklahoma, 175 farm operators who stored grain on farms gave an average shrinkage estimate for wheat at 3.5 percent for

the 1947-48 storage year. A weighted average weighted by the bushels stored by each farmer was only 2.7 percent. About one-half of the Oklahoma group of farmers estimated their shrinkage between one and 2.9 percent; one-sixth estimated shrinkage between three and 4.9 percent; one-sixth estimated shrinkage between five and 6.9 percent; and one-eighth estimated shrinkage exceeding seven percent. This study indicated that the small scale farmers gave a higher shrinkage estimate than the larger scale operators.¹

In 1923, the Departments of Agricultural Economics and Milling Industry at Kansas State College began a study on wheat shrinkage, loss, and damage in farm storage. Harvest weather was favorable for combining in 1923 and 1925 but increased precipitation during harvest in 1924 made that year less favorable for combining. Information obtained from the study included the following statement.

Wheat stored with less than 12 percent moisture almost invariably showed an increase in weight while that stored with more than 12 percent moisture showed a loss at the end of 4 to 5 months.²

High shrinkage rates for wheat in farm storage may result from storage of off-grade wheat, wet wheat, or through improper storage of good quality wheat. Farm storage often involves rather small quantities of wheat on the individual farms and therefore probably could not be conducted with a shrinkage

¹Hall, Thomas E., and other, op. cit., p. 14.

²As quoted by Swanson, C. O., and F. C. Fenton, The Quality of Wheat as Affected by Farm Storage, Kansas Agricultural Experiment Station Technical Bulletin 33, December, 1932, pp. 11-12.

percent as low as commercial elevators. Turnover in a commercial elevator may also reduce the length of storage and thus aid in reducing loss at that storage point through shrinkage. The low losses which some elevators show does indicate that better methods and better care in farm storage might reduce the shrinkage at that point of storage.

Shrinkage figures obtained from 138 Kansas elevators in 1920-21 by questionnaire indicate that shrinkage cost .7 cents per bushel of wheat handled. One hundred eighty-nine Kansas elevators audited in 1921-22 showed an average shrinkage cost of .4 cents per bushel of wheat handled. Fifty-nine Kansas elevators audited in 1921-22 showed an average shrinkage cost of .6 cents per bushel of wheat handled.¹

A grain company official of a line company operating country elevators estimated that a well managed country elevator in good condition should not normally have less than one-fourth percent shrink or more than one-half percent shrink. Shrinkage of one-half to one percent are not uncommon according to this official. He felt that high moisture wheat would show greater shrink than dry wheat and that a local elevator operator should become concerned if shrinkage exceeds one-half of one percent. Elevator shrinkage costs are passed to the farmer in the form of price reductions or discounts and storage costs.

¹Green, R. M., and E. B. Ballow, Country Elevator Margins and Costs in Marketing Kansas Wheat, Kansas Agricultural Experiment Station Bulletin 246, September, 1928, p. 58.

Interviews with farmers in Ford County and in Thomas County indicated that farmers tend to store their better grades of wheat on the farm unless the local elevators should refuse to accept wet or off-grade wheat. Although turnover probably helps reduce the shrinkage figure in local elevators, the local elevators often handle much wheat which the farmers would not attempt to store on the farm. Wet wheat not only is more likely to show heavy shrink than dry wheat but is also subject to damage by heating and insect damage unless given special care.

Elevator shrinkage will tend to be shifted to the farmer in the form of lower market prices or in the case of stored wheat in higher storage charges. Thus the shrinkage saving to the farmer by storing in an elevator will tend to equal only the shrinkage loss in farm storage in excess of the shrinkage loss in elevators as figured in their operating margins and passed on to the farmer in the form of price discounts or storage costs.

Elevator Storage Reduces Loss
(Fire, Weevil, Rodents, Winds, and Theft.)

Many farmers indicated that elevator storage reduces losses from storage. In Ford County 14.3 percent of the farmers interviewed in Thomas County 6.8 percent of the farmers interviewed felt that elevator storage reduced storage losses.

Some of the losses suggested by farmers were fire, wind, theft, weevils, rodents, shrinkage, reduced grade, and leakage from the bin. Farmers can carry insurance to reduce many of these losses and thus be protected even though the wheat may

be in farm storage. Normally, losses from weevils, rodents, shrinkage, reduced grade, and leakage from the bin are considered as noninsurable. Adequate care; treatment for insects; repair of bins; and storage of only good, dry, sound wheat will help prevent noninsurable farm storage losses but the farmer still assumes some risk.

When wheat is sold or is stored in a bonded warehouse, the risk of loss from fire, weevils, rodents, wind, theft, shrinkage, and reduced grade are shifted to the commercial storer. Usually elevators are believed to have smaller losses than are experienced in farm storage because the elevator is normally better equipped to move, clean, and mix wheat. Also the elevator operator should normally be skilled in handling wheat and often can devote more time to care for the wheat in storage than can the individual farmer devote to its care.

If the use of elevator storage reduces loss, one must add the excess losses resulting from farm storage to the farm storage costs. If the losses are calculated in cost studies as a part of the variable costs there would be no reason to consider losses in storage as a separate factor since the relative costs of storage would indicate the best storage position.

It is well that storage losses be recognized because if storage losses can be recognized and reduced the costs of storage can be reduced at both the farm level and at the elevator level.

A news release of April 13, 1939, from the Kansas State College Extension News Service indicates that undesirable storage

conditions can often be improved by attention at the proper time. According to this news release, data provided by E. H. Leker, State AAA Executive officer in Kansas indicated that 3,475 farm bins were inspected in 9 states. These bins represented about 90 percent of the storage loans in a nine state area. The inspection showed that 63 bins needed attention. All of the 63 bins except four were reconditioned by fumigation or other practices and only those four were recommended for liquidation. Fifty bins were ordered fumigated because weevils were present.¹

This example refers to conditions during only one year but does cover a large area. It indicates that when farmers do not give adequate care to stored wheat that losses may result which would not result if the wheat were placed in commercial storage under adequate supervision or if proper care were given to wheat in farm storage. When one considers that only 63 of 3,475 bins needed attention it might seem that the farmers were doing a good job of storing wheat on the farm. However, it must be remembered that these bins were under some supervision and better than average care may have resulted. The example does indicate that many of the bins which need attention can be given proper care to prevent further damage.

¹"Farm Storage Plan Works in the West.", Kansas State College Extension News Service release to Kansas Weeklies, April 13, 1939.

Elevator Storage is More Convenient

In Ford County 11.4 percent of the farmers favored elevator storage because they felt that elevator storage was more convenient. This reason for preference was not given by Thomas County farmers.

Several farmers indicated that much of their wheat was grown nearer to an elevator than to their farm bins. In such cases a saving could often be made in both time and cost by hauling the wheat directly to the elevator. Some farmers said that even with mechanical elevators on farms that it is much more convenient to unload wheat at an elevator.

Many farmers include the shifting of risk to the elevator under the heading of convenience since then the farmer does not have to take time to check the wheat, treat for insects, or buy insurance for the wheat while in storage.

High wheat prices during recent years have caused some farmers to feel that elevator storage was the easiest possible way to handle the crop while other farmers feel that convenience of elevator storage saves money through a reduction in the time and labor requirements.

The average distance to the nearest elevator for the Ford County farmers interviewed was 6.2 miles and the average distance to the nearest elevator for the Thomas County farmers interviewed was 6.2 miles. When elevators are not too busy and can weigh and dump a load of wheat as soon as it arrives, the farmer can often drive several miles to an elevator and return to the combine about as quickly as if he went a shorter distance to farm storage

and had to spend more time unloading the wheat.

When wheat is hauled to the local elevator and stored there the farmer usually has the opportunity of learning the results of tests to determine test weight, moisture, and the quantity of wheat harvested. Weight tickets from the elevator provide an easy and accurate means of dividing a share crop if one party desires to sell at harvest or store the wheat in an elevator.

Farm Bins Not in Physical Condition to Store Wheat

Elevator storage was favored by 5.7 percent of the Ford County farmers interviewed and by 4.5 percent of the Thomas County farmers interviewed because farm bins were not in physical condition to store wheat. There were in addition many farmers who experienced difficulties of physical handling which influenced the maintenance of the quality of the wheat while in storage. These physical difficulties included snow entrance into steel bins, water entry through some roofs, and lack of sufficient tightness to permit adequate fumigation.

A Georgia study for 1949 indicated that only 3.5 percent of the bins in that state were rodent-proof. Only nine percent of the small grain bins were rodent-proof. Only 25 percent of all storages and 50 percent of all grain bins were tight enough to be fumigated.¹ Storage facilities constructed on farms in Ford

¹Grain Storage Facilities in Georgia, 1949, Georgia U.S.D.A. Council and the Grain Branch, Production and Marketing Administration, Athens, Georgia, May 1950, p. 1.

County and in Thomas County are usually constructed for wheat storage and would therefore probably be superior to the average bin built in Georgia for general storage. The Georgia study does indicate some of the problems which are present when storage facilities are not in good physical condition.

The age of the farm bins in Ford County and of those in Thomas County was determined when the operator knew the age of the bins. An age was given for 207 structures within those two counties. The average age of the bins in Ford County was 15.0 years and for Thomas County the average age of the bins was 14.4 years. The two county average was 14.6 years. Wood bins with concrete floors had an average age of 19.7 years in Ford County and 19.4 years in Thomas County. Steel type bins were most numerous and had an average age of 12.5 years in Ford County and 14.4 years in Thomas County. The "Ever Normal Granary" movement probably accounts for many of the newer bins of average age or less. Steel type multi-purpose buildings form the newest group of bins on farms. Two of the 70 farmers interviewed in Ford County had steel type buildings for wheat storage and the average age was 4.5 years. In Thomas County eight of the 44 farmers had steel type buildings for wheat storage and the average age was 2.9 years. Although the average age of the storage structures in these two counties was only approximately 15 years, 39 of the 207 bins were over 25 years of age.

In some cases much of the unused bin space on farms consisted of the oldest storage units. Although these units

are normally unused, there is only a very small fixed cost as compared to new storage units and the old structures do provide temporary space when the wheat cannot be delivered to commercial storage.

Wheat is Easier to Sell from an Elevator

In Ford County 4.3 percent of the farmers interviewed favored elevator storage because they felt that wheat was easier to sell from elevator storage than from farm storage. In many cases it appeared that the physical act of delivering wheat to the market where it was sold was considered as a part of the actual selling process. If the wheat must always actually be delivered to the elevator before the sale is made, farm storage might be inconvenient if weather was unfavorable for hauling or if the farmer had other work to be done.

If the local elevator is buying wheat and does not plan to ship it immediately, farmers may be able to sell their wheat and make delivery within a specified time. In such a case the actual sale of farm stored grain would be just as easy as if the wheat was stored in the local elevator. The physical process of delivering the wheat to the buyer would be a movement which is made during the busy harvest season if the wheat is stored in the local elevator. In such a case the farmer must decide whether it is more convenient to move the wheat to the local elevator at harvest or at a later date when the wheat is sold.

Other Reasons

Several farmers preferred to use elevator storage for some other reasons not previously discussed under a separate heading.

Elevator Storage Leaves Farm Bins Free for Other Uses.

Some farmers have other uses for their farm storage space so they do not like to store wheat on the farm. In Ford County one farmer stored his wheat in the local elevator so his bins would be free to fill with grain sorghums. This farmer felt that discounts on grain sorghums were higher than on wheat and that elevator operators thus took advantage of the farmer who delivered grain sorghums for storage. These sorghums were produced on irrigated land so the farmer could depend on production of a grain crop almost every year to fill his bins.

In Thomas County one farmer reserved his farm storage space for feed grains since he needed to store these on the farm where they would be available for daily feeding.

Existing farm storage should be used in the most efficient way whether that requires that it be used for wheat or for some other use.

Additional Costs if Government Loan is Taken on Farm Stored Wheat.

In Ford County one farmer favored elevator storage because he said there were additional costs when the government loan was taken on farm stored wheat. The farmer specifically mentioned

inspection costs. Inspection and supervision of bins under loan is more expensive when the wheat is widely distributed over a large area and stored in small quantities than is inspection and supervision of larger quantities when concentrated in commercial storage.

The additional cost in the case of a small loan may seem expensive but farmers have always faced high interest rates and generally have never had adequate loan systems. The three percent interest rate paid by wheat farmers for loans taken on stored wheat is a favorable interest rate as compared to loans during past periods. Small loans at this low rate require additional charges to cover the costs of administering the loan. This farmer should compare his total cost for the loan with the total costs for obtaining loans from other sources. Many farmers ignore the costs involved when a loan is taken on wheat stored in an elevator.

Government Loan Might Tie-up Bins. Although only one Ford County farmer favored elevator storage to prevent having farm bins tied-up, several farmers gave this answer as a criticism of the loan program. These farmers felt that there are harvest seasons when farm storage must be used to handle the crop and that in the future harvest might arrive and the farm bins would still be filled with old crop wheat. Many farmers also find farm storage of milo profitable to avoid heavy discounts during harvest and farm bins of wheat under loan might not permit farm storage of the milo crop.

Administration of the loan program which would assure farmers

that local storage facilities would be available for the new crop would probably cause farmers to use farm stored wheat loans to a greater extent and would help prevent shortages of storage space in local areas during harvest.

OTHER FACTORS WHICH FARMERS SHOULD CONSIDER

There are some other factors which farmers should consider and which were not mentioned by farmers interviewed. Some of these other factors probably would have been mentioned had the farmers been interviewed during some other year.

Distance to Elevator

Distance from the market has often been considered as a major factor in determining whether a farmer must store on the farm or in commercial storage facilities.

In the survey of Ford and Thomas County farmers, this factor was often included under the heading of convenience or cost. If elevators are not able to accept the wheat without delay, the farmers must hire additional trucks to haul the wheat from the combines to the elevator. Of course the farmer with his crop growing the greatest distance from the elevator will need either a larger number of trucks or larger trucks to avoid slowing harvesting operations.

Farmers indicated that delays at elevators were of greater importance than distance in requiring use of farm storage. It should be pointed out that all of the farmers included in the

survey lived not more than 15 miles from a local elevator. In cases of greater distances, this would become an increasingly important factor.

Many truckers have a basic hauling charge and additional charges for each mile the wheat is hauled. Under these conditions, the cost per mile is usually less as distance increases (within reasonable limits). A farmer may find that one continuous haul to the elevator is cheaper than two hauls when farm storage is used. One haul would be from the combine to the farm bin and the other haul would be from the farm bin to the local elevator.

Some farmers feel that they save money by owning their own truck or trucks to haul wheat. In calculating cost differences many farmers tend to include only cash costs or out-of-pocket costs and fail to include costs for depreciation, taxes, licenses, labor for hired drivers, and other costs.

Farmers interviewed often passed up the nearest elevator and hauled wheat to an elevator farther away if they felt they got a higher price or better service. Among the farmers interviewed, 17 farmers or 14 percent normally passed the nearest elevator and used the services of an elevator farther away. Cooperative elevators attracted 13 of the 17 farmers who did not haul to the nearest elevator.

Although this action indicated that cooperative elevators attracted the farmers and caused them to haul greater distances, no farmers interviewed mentioned dividends from the cooperative elevators as a factor causing them to store in commercial storage.

In some cases, cooperative elevators could be used by farmers to solve their storage needs and the dividends received should help provide more economical storage.

Credit Needs

Farmers planning future storage needs should consider possible credit needs. Storage in bonded warehouses provides a warehouse receipt which farmers can often use to obtain a needed loan. Such a receipt usually provides the lender with more acceptable security than if the wheat were in farm storage and perhaps of unknown quality. The wheat in farm storage would also be subject to some noninsurable risks which would be covered by the warehouse receipt if wheat was stored in commercial storage.

Green found that inability to get local bank credit caused much wheat to be sold during the harvest season.¹ The present interest rate of three percent on loans under the support program provides the cooperating farmers with loans at a reasonable rate of interest. If these loans are not continued or if farm financial conditions become less favorable, financial needs will become a more important factor than at the present time in influencing the use of farm storage.

¹Green, R. M., The Effects of Shortage of Farm Storage Space and Inability to Get Local Bank Credit on the Movement of Kansas Wheat to Market, op. cit., pp. 25-28.

Government Regulation

Farmers planning future storage plans and needs should consider possible regulations concerning acreage or production restrictions. If the governmental policies should shift and there were no loans or purchase agreements to help support prices, the price of wheat might fall to lower levels and a larger percent of the crop would probably be used for feed and perhaps for industrial use. Such a shift might cause changes in storage plans. If larger quantities of wheat were fed on farms, there would be greater need for farm storage so the wheat would be left on the farm close to the feeding point.

During recent years additional regulations have been enforced concerning pure food regulations. In the future farmers may find that if they store wheat on the farm and plan to sell the wheat at a later time for food purposes, they may be forced to keep the wheat free from weevils, rodent hair, and other objectionable matter. This action would require improved care by many farmers if they continued to use farm storage facilities.

Future Farm Plans

Those farmers planning for future storage should consider the type of farming operations which will be conducted on the farm in the future. The farmers should consider whether wheat will be the only enterprise or whether there will be other enterprises on the farm. Perhaps a cattle shed could be planned to provide adequate temporary storage for wheat during years

when production might be large and elevators are overcrowded. In other cases there may be sorghums to fill empty bins not filled by the wheat crop.

If farm facilities are to be used for wheat, the facilities probably should be ample to hold an average crop while extra storage can often be provided through temporary use of other structures. Examples were found by the interviewer where the available farm storage space was at least five times the space needed for an average crop. Usually such conditions were caused by changes in farm plans and reduced wheat acreage. Such an excess of permanent storage results in high fixed costs.

RESULTS OF TESTS ON SAMPLES FROM ALL BINS TESTED

Samples were obtained from 29 farm bins in which wheat was stored so that tests could be made on the samples. These tests were used to verify the reasonableness of the farmers' answers and to determine some of the problems occurring during farm storage which might influence the storage position used by farmers.

The samples were taken from the bins in the manner described in detail in the earlier section of this thesis under the heading, Materials and Methods Used.

Bins were sampled in August, October, and December, 1950. The samples were graded at the Kansas Grain Inspection Office, Salina, Kansas, and the insects were counted at the Department of Entomology laboratories at Kansas State College, Manhattan, Kansas.

Entomology department staff members aided in insect identification when the species were uncertain.

A summary of the results obtained through tests on the 29 bins sampled during late August is shown in Table 4.

Table 4. Results of tests and insect counts on August samples from farm bins.

Item	: Ford : county	: Thomas : county	: Both : counties
Total number of bin sampled	14	15	29
Average test weight. (Lbs. per bu.)	62.0	59.2	60.5
Average moisture content. (Percent)	11.0	12.9	11.9
Bins grading:			
No. 1 Dark Hard Wheat	12	5	17
No. 1 Hard Wheat	0	1	1
No. 2 Dark Hard Wheat	2	4	6
No. 2 Dark Hard Tough Wheat	0	2	2
No. 2 Hard Wheat	0	1	1
No. 3 Dark Hard Wheat	0	1	1
No. 4 Hard Wheat	0	1	1
Weevils ¹	7	2	9
Other Insects ²	45	118	163

¹Weevil classification included Rice Weevil, Granary Weevil, and Lesser Grain Borer found in total number of samples averaging approximately 2,000 grams each.

²Other insects included all other insects found in the total of samples averaging approximately 2,000 grams each.

Test weight averaged 2.8 pounds higher and moisture percentage averaged 1.9 percent lower in Ford County samples than in Thomas County samples. Much of the Ford County crop was relatively light yielding and was harvested under rather dry conditions except for the later fields. Thomas County wheat had heavy growth, heavy yields, and a very humid harvest season.

Samples containing four of the seven weevils found in Ford County samples were found in a sample from a bin which contained a small quantity of old wheat in the bottom of the bin. The farmer treated the bin after this test and later insect counts showed that the treatment was effective. In Thomas County 65 of the other insects were found in two damp bins which were emptied into commercial storage facilities before the October 27 sampling.

Test weight was the grading factor which was responsible for the No. 2, 3, and 4 grades of wheat tested. Farmers were notified of the grade and insect counts.

The second sample from each bin was taken during the last week in October and was graded October 27. There were 22 bins sampled this time. In one case a farmer declined further cooperation and the other six bins of wheat not remaining for resampling had been sold, sown, or the grain moved to commercial storage facilities.

In Ford County one farmer said that he moved his wheat to commercial storage because of fear of insect damage. Other farmers may have acted in a like manner after learning the results of the previous tests. Some may have treated bins on the basis of this information without reporting such treatment.

High moisture content may account for some of the movement of wheat from farm to commercial channels although these cooperating farmers had planned to hold this wheat until the end of the year. The six bins not resampled in October, 1950, because

the wheat which had been removed from farm storage averaged 13.0 percent moisture on August 30, and the owner of the driest bin stated that possible insect damage caused him to move the wheat into commercial storage. The moisture content of the other five bins ranged from 13.2 to 14.8 percent. All of these were above the 13.0 percent figure considered by many as an upper safe limit.

The humid conditions extending through July and August may have caused some farmers to avoid further risk in trying to store high moisture wheat for as long a period of time as they had originally planned to store it on the farm.

Table 5. Results from tests and insect counts on October samples from farm bins.

Item	: Ford : county	: Thomas : county	: Both : counties
Total number of bins	11	11	22
Average test weight. (Lbs. per bu.)	62.4	59.3	60.9
Average moisture content. (Percent)	10.4	12.7	11.5
Bins grading:			
No. 1 Dark Hard Wheat. (Number)	11	5	16
No. 1 Hard Wheat	0	1	1
No. 2 Dark Hard Wheat	0	2	2
No. 2 Dark Hard Tough Wheat	0	1	1
No. 2 Hard Wheat	0	1	1
No. 4 Dark Hard Wheat	0	1	1
Weevils	1	3	4
Other Insects	11	45	56

The average test weight of the bins remaining for the October sampling was .4 pound higher than the average for the bins originally sampled during August. The seven bins not resampled averaged 60.0 pounds test weight when originally

sampled so the loss of these bins from the group being tested would cause increased test weight average. Possible increases in test weight in individual bins and sampling errors would account for the remainder of the increase.

The moisture content average was .4 percent lower than the average for the 29 bins originally sampled. The disposal of six of the ten wettest bins of wheat accounted for part of this reduction. Moisture movement within the individual bins, drying, moisture gain, and sampling error account for the balance.

Grade changes occurred in four bins. There were changes in two bins from No. 2 Dark Hard Wheat to No. 1 Dark Hard Wheat because of increases in test weight. In one bin there was a change from No. 3 Dark Hard Wheat to No. 2 Dark Hard Wheat through an increase in test weight. In one bin there was a change from No. 4 Hard Wheat to No. 4 Dark Hard Wheat through a difference in color grading.

In two bins where there were grade changes there were changes in the quantity of wheat in the bin. In these bins it is quite possible that there were differences in the quality of wheat in various parts of the bin so that the part left in storage was of a higher grade.

Weevils were found in four of the bins. Gasoline was sprayed into one of those bins before the bin was filled with wheat. The other three bins were sprayed with a DDT solution. Fumigating materials were used in two bins after filling but neither bin had been treated with a quantity sufficient to meet

recommendations by entomologists.

Other insects were found in 11 bins. The samples from six bins contained 46 of the 56 other insects counted. Bin FB 49 with a moisture content of 10.9 percent contained eight other insects and was sprayed only with gasoline before filling. Bin TB 4 with a moisture content of 12.8 percent contained seven other insects, was sprayed with DDT solution before filling and was fumigated before the October sample was taken. Bin TB 15 with 13.2 percent moisture contained two other insects, was sprayed with DDT solution, and was fumigated before the October sample was taken. Bin TB 20 with 12.4 percent moisture contained ten other insects and was limed only before filling. Bin TB 38 with 13.4 percent moisture contained four other insects and was sprayed with DDT before filling. Bin TB 42 with 14.3 percent moisture contained ten other insects and was sprayed with DDT before filling.

The third sampling was made during the last week in December and 19 bins were resampled. These samples were tested December 29, 1950. In Ford County three bins were empty and therefore could not be resampled. These three bins averaged 62.8 pounds test weight when tested in October and contained only 10.2 percent moisture. The October tests showed two of these bins as insect free and the insect count in the third was one other insect. These conditions would indicate that factors other than quality or insects caused the farmers to move the wheat from these three bins.

A summary of the results obtained through tests on the 19 bins resampled during late December is shown in Table 6.

Table 6. Results of tests and insect counts on December samples from farm bins.

Item	: Ford : county	: Thomas : county	: Both : counties
Total number of bins sampled	8	11	19
Average test weight. (Lbs. per bu.)	62.3	59.3	60.5
Average moisture content. (Percent)	10.6	12.7	11.8
Bins by grades:			
No. 1 Dark Hard Wheat. (Number)	8	6	14
No. 2 Dark Hard Wheat	0	3	3
No. 2 Dark Hard Tough Weevily Wheat	0	1	1
No. 3 Dark Hard Wheat	0	1	1
Weevils	0	5	5
Other Insects	5	82	87

The Thomas County test weight and moisture content averaged the same as in October. Since these were the same bins as were sampled in October the average for test weight and moisture remained the same except for changes too small to show when the averages were rounded to the nearest tenth.

There were shifts or changes within the individual bins.

Bin TB 20 because of a test weight increase changed from No. 4 Dark Hard Wheat to No. 3 Dark Hard Wheat. Bin TB 42 gained .4 percent moisture and lost .3 pound on test weight to grade No. 2 Dark Hard Tough Weevily Wheat. Bin TB 39B graded No. 1 Dark Hard as compared to the October test when it graded No. 1 Hard Wheat.

Bin TB 4 also gained a "Dark" classification and graded No. 2 Dark Hard Wheat.

Bin FB 49 contained the five insects counted in Ford County samples. This bin had the highest moisture content of the remaining Ford County bins but it tested only 11.1 percent moisture. This bin was one of the four remaining Ford County bins which had not been sprayed with DDT. It was sprayed with gasoline before filling.

Bin TB 4 contained 13.4 percent moisture and bin TB 42 contained 14.7 percent moisture. These were the two wettest Thomas County bins remaining for the final tests. These two bins contained the five weevils found in the Thomas County bins samples and also contained 57 of the 82 other insects counted in the samples. Both bins showed large increases in insect numbers over the counts made on the October samples. Bin TB 4 was sprayed with DDT solution before filling while bin TB 42 was neither sprayed nor fumigated.

The other Thomas County bins showed no large increases in insect counts but several of the bins testing over 13.0 percent moisture may present insect problems if the wheat remained in farm storage until warm spring weather.

The results of the test on samples from the farm bins indicate several storage problems faced by these farmers. These problems include:

1. Farmers change their storage plans.
2. Farmers often store wet wheat or wheat of unknown quality.
3. Many farmers use inadequate insect control measures.

Farmers Change Their Storage Plans

Many farmers may voluntarily or involuntarily change their storage plans after the grain is placed in storage. The cooperating farmers, who owned the wheat in the 29 bins sampled, indicated that they planned to hold this wheat in farm storage at least until after January 1, 1951. All wheat was sold, sown, or moved to commercial storage from nine of the 29 bins before January 1, 1951. One farmer declined further cooperation and part of the wheat was sold, sown, or moved to commercial storage from eight of the remaining 19 bins.

Dry weather, insects, and hail caused some low wheat yields in part of Ford County. In some cases Ford County farmers sold seed wheat to other farmers during the fall of 1950. Such purchases of seed wheat caused an increase in liquidation of farm storage.

Some Thomas County farmers were forced to remove wheat from farm storage because it was cut under wet conditions and could not be held in farm storage for a long period of time.

Only one farmer indicated that he moved his wheat to commercial storage because he was afraid of possible insect damage. Several bins were fumigated thus indicating precaution by the farmer to prevent insect damage. The farmers cooperating in this study were informed of the test results showing the quality of their wheat and the insect infestation. Full knowledge of these conditions of the wheat in farm storage may have caused increased movement from the farm to commercial storage.

A period of rising prices which began during early December 1950, and reaching a high peak during January, 1951, may have caused some farmers to feel that the price was favorable and some wheat was sold during this period.

Daily low cash price for No. 2 Dark Hard Wheat rose from \$2.20 on December 1, 1950, to \$2.34 3/4 on December 29, 1950. Daily high price rose from \$2.38 on December 1 to \$2.48 on December 29, 1950. March futures rose 12 7/8 cents and May futures rose 11 7/8 cents during the same period.¹

Farmers Often Store Wet Wheat or Wheat of Unknown Quality

Some of the Thomas County farmers removed wheat from farm storage because it was harvested under wet, unfavorable conditions, and was too wet to be held under normal farm storage conditions for a long period of time. Some of the farmers felt that although the wheat was not accepted for storage by the elevators that it could be successfully stored on the farm. Many elevators refused to accept wheat for storage if the moisture content exceeded 14 percent.

Part of the wheat stored on farms was not tested for moisture content before it was placed in storage. Results of the interviews with 114 farmers showed that 41 farmers or 36.0 percent usually do not have moisture tests made on wheat

¹Kansas City Grain Market Review, Daily quotations for December, 1950, and January, 1951.

which they store on the farm. Many feel that experience and observation are sufficient to determine whether wheat can be stored or not. A common practice among farmers is to have moisture tests made on the newly combined wheat until they feel that the moisture content is low enough for storage. Then they often continue to store wheat without moisture tests even though there may be variation in moisture content during the harvest season.

Several farmers complained to the interviewer that they felt moisture tests were not a fair test of moisture content and did not give a true indication as to whether or not the wheat could be stored.

Many farmers who harvest wet wheat realize that it is too wet for the most satisfactory storage and that if the elevator does accept it that it may be discounted. In some cases they continue to harvest this wet wheat because they feel that if it stands for a longer time the risk of loss by rain, wind, and hail may exceed the discount. Some farmers and elevator operators indicated that custom combine operators were inclined to cut wet wheat which increases the extent of the problem.

Perhaps the most common check used by farmers to determine whether or not a bin is heating is "simply made by inserting an iron rod into the wheat bin. The farmer visits the bin and pulls out the rod checking to see if the rod is hot. Since this is a frequent practice it indicates that many farmers are in doubt as to whether their wheat is in a storable condition or not.

This practice also indicates that the farmers are at least using some method to check the condition of wheat and through such simple action some wheat is turned or sold before the farmers suffer a large loss.

Farmers who know the moisture content of their wheat in farm storage are in a better position to prevent heat damage and insect damage to stored wheat than the farmer who does not know the condition of his farm stored wheat.

Many Farmers Use Inadequate Insect Control Measures

There were many cases of inadequate control of insects. Although spraying of bins with a DDT solution was generally practiced, it did not alone provide an adequate control of insects under the farm storage conditions involving the bins checked. Nearly all of the farmers who used DDT sprays said that they mixed the solutions according to the direction provided with the insecticide. There appeared to be great differences in the quantity applied to the bin. Variation in the bin construction made effective application difficult in some cases.

Most of the bins sprayed with DDT were sprayed from 10 days to 14 days before harvest. The interviewer inquired to determine the reason for spraying at this particular time. The usual answer indicated that during this period the farmer was making his harvest preparations and if he did not complete such jobs several days ahead of harvest that he probably would not take time for such jobs during the last few days before harvest.

Some bins were sprayed two to four weeks before harvest.

Fumigation proved inadequate in some cases because the farmers did not use an adequate amount of fumigant, did not have tight bins, or did not level the wheat in the bins before fumigation. Some farmers fumigated and obtained excellent results thus indicating that many more farmers could do a good job of fumigation if they understood how and were willing to follow the necessary principles.

RESULTS OF TESTS ON SAMPLES FROM NINETEEN BINS SAMPLED THREE TIMES

Since 19 of the 29 bins were sampled three different times a comparison of the test results from these 19 bins should give a better indication of quality changes while wheat is in farm storage. The 19 bins sampled three times included eight in Ford County and 11 in Thomas County. Individual bins showed many variations but averages for all the bins showed very little change between late August and late December.

In the 19 bins there were eight changes in grade during the period. Changes to a higher grade were found in seven bins and one bin dropped in grade by grading "Weovily". The changes included three which showed improvement through the addition of a "Hard" classification to the grade. Changes through increased test weight caused four bins to improve in grade. All grading was done at the same inspection office.

The only bin which declined in grade showed 14.3 percent moisture during late August. This percentage rose to 14.7 in

late December when the sample graded "Weevily". There was no report of spraying or fumigation to prevent or destroy insects. Had preventative measures been taken, this bin probably would not have graded down at this time and thus none of the bins would have shown a decline in grade.

The six bins which showed improvement in grade between August 30, and December 29, might indicate that farmers could maintain or even improve quality through farm storage. A study of the individual bin variations indicates that other factors may account for part of the variations.

The results of the tests and insect counts for the 19 bins sampled three times are shown in Table 7 and Table 8. A brief discussion of the changes in those bins showing changes equal to or larger than the medial change follows.

Bin TB 4 showed changes of one pound in test weight and .8 percent in moisture content. A large quantity of the wheat in this 691 bushel bin was removed before October 27, 1950. The second sample showed an increase of .5 pound in test weight and a reduction of .2 percent in moisture content. The third sample showed a decrease of one pound in test weight and an increase of .6 percent moisture. A sample of approximately 2,000 grams contained five weevils and 32 other insects. This infestation probably accounts for much of the quality change after the second tests made in October.

Bin TB 20 showed changes of one pound in test weight and 1.2 percent moisture content. This 2,765 bushel bin contained wheat

Table 7. Variation in test weight, moisture content, and grade of wheat while in farm storage. (1950).

Bin Number	Size in inches	Test : Percent	Wt. : moisture : Grade ²								
FB 1	2,043	63.1	9.7	1 DH	63.0	9.9	1 DH	63.0	10.1	1 DH	1 DH
FB 16	2,432	62.8	11.3	1 DH	62.6	11.1	1 DH	62.3	11.0	1 DH	1 DH
FB 29	2,100	61.7	11.3	1 DH	61.7	10.6	1 DH	62.0	10.9	1 DH	1 DH
FB 42	1,350	63.4	9.9	1 DH	63.5	10.0	1 DH	63.5	9.8	1 DH	1 DH
FB 49	274	59.7	12.5	2 DH	62.4	10.9	1 DH	62.8	11.1	1 DH	1 DH
FB 64	922	61.6	10.6	1 DH	61.5	10.7	1 DH	61.5	10.6	1 DH	1 DH
FB 69	1,000	61.0	10.4	1 DH	61.0	10.5	1 DH	61.1	10.6	1 DH	1 DH
FB 70	1,000	62.7	9.7	1 DH	62.5	10.2	1 DH	62.3	10.3	1 DH	1 DH
Average	1,151	62.0	10.7		62.3	10.5		62.3	10.6		
FB 2	1,536	59.4	13.0	2 DH	60.0	12.9	1 DH	60.0	13.0	1 DH	1 DH
FB 4	691	58.5	13.0	2 H	59.0	12.8	2 H	58.0	12.4	2 DH	2 DH
FB 5	652	61.3	12.4	1 DH	61.2	12.4	1 DH	61.3	12.4	1 DH	1 DH
FB 15	1,120	57.5	12.0	3 DH	58.1	13.2	2 DH	58.4	13.0	2 DH	2 DH
FB 20	2,765	55.0	12.7	4 H	55.2	12.4	4 DH	56.0	12.3	3 DH	3 DH
FB 38	1,500	60.5	13.2	1 DH	60.4	13.4	1 DH	60.2	13.2	1 DH	1 DH
FB 39A	749	58.1	11.9	2 DH	58.2	11.7	2 DH	58.4	11.7	2 DH	2 DH
FB 39B	1,220	60.5	12.0	1 H	60.6	12.0	1 H	60.1	12.2	1 DH	1 DH
FB 40	634	60.4	12.3	1 DH	60.0	12.5	1 DH	60.3	12.6	1 DH	1 DH
FB 42	1,280	59.1	14.3	2 DH	59.3	14.3	2 DH	59.0	14.7	2 DH	2 DH
FB 44	3,000	60.2	11.5	Tough	60.5	11.6	Tough	60.1	10.8	Tough	Tough
Average	1,402	59.1	12.6	1 DH	59.3	12.7	1 DH	59.3	12.7	1 DH	1 DH
Av. both counties	1,296	60.3	11.8		60.6	11.7		60.5	11.8		

¹/Indicates date bin sample was graded.²/Official grain grading standards use "H" to indicate Hard and "D" to indicate Dark wheat for wheat of the Hard Red Winter Wheat Class.

Table 8. Variation in insect counts and moisture content of wheat while in farm storage. (1950.)

Bin	Size in bushels	Percent moisture	Percent Weevils ²	Insects ³	Percent moisture	October 27		December 31	
						Wheat ¹	Ansari ³	Wheat ¹	Ansari ³
FB 1	2,048	9.7	0	0	9.9	0	1	10.1	0
FB 16	432	11.3	0	0	11.1	0	0	11.0	0
FB 29	2,100	11.3	0	5	10.6	0	0	10.9	0
FB 42	1,330	9.9	0	0	10.0	0	0	9.8	0
FJ 49	374	12.5	2	16	10.9	1	8	11.1	5
FB 64	922	10.6	0	1	10.7	0	0	10.6	0
FB 69	1,000	10.4	1	0	10.5	0	0	10.6	0
FB 70	1,000	9.7	4	1	10.2	0	0	10.3	0
Average	1,151	10.7		10.5				10.6	
					Thomas county				
TB 2	1,536	13.0	0	10	12.9	0	6	13.0	0
TB 4	691	13.0	0	18	12.8	1	7	13.4	5
TB 5	832	12.4	0	0	12.4	0	0	12.4	0
TB 15	1,210	12.0	0	1	13.2	1	2	13.0	0
TB 20	2,765	12.7	0	0	12.4	0	10	12.3	0
TB 38	1,500	13.2	0	4	13.4	1	4	13.2	7
TB 39A	749	11.9	0	3	11.7	0	1	11.7	2
TB 39B	1,210	12.0	0	0	12.0	0	0	12.2	0
TB 40	634	12.3	0	13	12.5	0	1	12.6	1
TB 42	1,280	14.3	0	2	14.3	0	10	14.7	0
TB 44	3,000	11.5	2	1	11.6	0	0	10.8	0
Average	1,402	12.6		12.7				12.7	
Av. both counties	1,296	11.8		11.7				11.8	

¹/Moisture tests were made on dates indicated. Insects were counted August 31, November 2, and January 5, 1951.

²/Weevil classification includes Rice Weevil, Granary Weevil, and Lesser Grain Borer.

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³/Other insects includes all other insects not included under the weevil group.

which tested 55.0 pounds in test weight and 12.7 percent moisture content on August 30, 1950. It graded as No. 4 Hard Wheat. Without quantity variations, the same bin showed 55.2 pounds test weight and 12.4 percent moisture content when tested on October 27. It graded No. 4 Dark Hard Wheat. About one-third to one-half of the wheat was removed from the bin before the December 29 test when the test weight was 56.0 pounds and the moisture percentage was 12.3 percent.

Bin TB 15 showed a change of .9 pound test weight and 1.2 percent moisture. Part of the wheat was removed from this bin before the October 27 tests. An increase of .6 pound in test weight and an increase of 1.2 percent in moisture content was found by the October 27 tests. The December 29 tests showed an additional gain of .3 pound in test weight and a loss of .2 percent in moisture content. The wheat from this 1,210 bushel bin was all sold by January 26, 1951, and tested 58.0 pounds test weight when sold.

Bin TB 2 showed a variation of .6 pound in test weight but the moisture varied only .3 percent. This was the median moisture variation. About one-half of the wheat was removed from this 1,536 bushel bin before the October 27 tests. The October 27 tests showed .6 pound increase in test weight and the December 29 tests showed the same test weight as found in October.

Bin FB 16 showed a rather consistant decline in test weight and moisture content. This 432 bushel bin contained wheat not over three feet in depth. The total loss in test weight was .5

pound. There was a loss of .3 percent moisture of a loss equal to the median change. Part of the wheat from this bin was sold January 20, 1951, but no test was made. This bin tested 62.3 pounds per bushel and showed 11 percent moisture when tested on December 29, 1950.

Bin TB 39 B showed no change in moisture content by the October 27 test and only .1 percent increase in test weight. Without variation in the quantity of wheat in this 1,210 bushel bin, the December 29 tests showed a decrease of .4 pound in test weight. The increase in moisture was .2 percent. The sample graded Dark Hard rather than Hard as it did in August and in October. The moisture increase was less than the median moisture change.

Bin FB 70 varied .4 pound in test weight and .6 percent moisture. The decline in test weight was gradual and was not sufficient to cause a drop in the grade. Part of the moisture increase and variation can probably be contributed to the activity of insects in the grain. The farmer effectively treated this 1,000 bushel bin and destroyed the insects before the October 27 tests.

Bin TB 40 varied .4 pound in test weight and .3 percent in moisture content. Most of the wheat was removed from this 634 bushel bin before the October 27 tests and the remainder when sampled could have absorbed some moisture from the concrete floor. Insect activity could also probably account for part of the .3 percent moisture gained when tested December 29.

Bin TB 44 varied .4 pound in test weight and .7 percent in moisture content. The quantity of wheat in this 3,000 bushel bin was reduced before the December 29 tests. The test weight was .3 pound higher on October 27 than on August 30, then decreased by .4 pound by December 29. This bin was fumigated about 2^{1/2} hours before the August 30 sample was taken. Part of the moisture decline may have resulted through decreased insect activity as the fumigation appeared effective according to insect counts made on the October 27 sample. About 50 percent of the insects were dead in the sample taken 2^{1/2} hours after the bin was treated with fumigant. The remainder of the wheat from this bin was sold during January 1951. It was sold as No. 1 but no moisture test was made.

Bin TB 29 varied .7 percent in moisture content but only .3 pound in test weight. The test weight change was below the median change. The owner knew that the top entrance to this 2,100 bushel bin blew off during a rainstorm before the August 30 test. Since one vertical series of probings was made below this entrance, any moisture which entered the bin, showed up in the first test then dried out or was absorbed by dry wheat in the bin. There was no variation in the grade of wheat in the bin. This wheat was sold April 29, 1951, and tested 60 pounds per bushel.

Bin FB 1 gained .4 percent in moisture content. This 2,048 bushel bin was very dry (9.7 percent moisture content) when tested on August 30 and could have absorbed some moisture

from the air. No insects were found in the December 29 sample. This wheat was still in storage on February 2, 1951.

Bin TB 42 gained .4 percent in moisture content. This bin graded "Tough" on August 30 and on October 27. On December 29, it graded "Tough Weevily". Activity by insects probably accounted for much of the moisture increase as the increase came after the insect counts were high. Wheat in this 1,280 bushel bin contained 14.3 percent moisture when tested on August 30, 1950. This was the wettest bin remaining for the December test and the only bin to show a reduction in market grade.

Most of the variation in test weight and moisture content was found in samples from bins where the quantity of wheat was reduced by removal between the times when samples were taken from the bins.

Seven of the ten bins with test weight changes equal to or greater than the median change had variation in the quantity of wheat in the bin. Eight of the twelve bins with moisture changes equal to or greater than the median change had variation in the quantity of wheat sampled. In eight bins both variations in test weight and in moisture content were equal to or greater than the median change and seven of these eight bins had variation in the quantity of wheat in the bin when sampled. There were no variations in test weight or in moisture content greater than the median in bins where the quantity of wheat was constant.

CONCLUSIONS

This study indicates that even within a relatively small area a large number of factors influence farmers to store their wheat in both farm and in commercial storage facilities. A greater percentage of the farmers would prefer to use commercial storage facilities if these facilities could always be available for use when needed. Since many farmers are unable to secure storage facilities at elevators when such facilities are desired, farmers are forced to maintain farm storage facilities to use when commercial facilities are not available.

Seasonal price studies for wheat indicate that possible gains which can be secured by storing wheat each year and holding for a higher seasonal price probably do not make storage profitable. There are years when good profits can be obtained through price increases while the wheat is in storage and other years when losses will result because of price decreases or through price increases not great enough to pay the costs of storage.

Elevator storage is often more convenient than farm storage and shifts the risks from the farmer to the commercial storer. Some farmers probably overestimate the benefits gained by letting the elevator absorb the wheat shrinkage. Dry wheat under good storage conditions can be stored with little shrinkage and sometimes will gain in weight. Wet wheat normally will show greater shrinkage but is often heavily discounted when delivered to the elevator thus reducing the advantages of letting the elevator

absorb the shrinkage. Often wet wheat is not accepted for storage at local elevators.

Since some losses are usually noninsurable, elevator storage will reduce the possible losses from insects, shrinkage, and reduced market grade to the farmer. Losses resulting from reduction in market grade are an example of the noninsurable losses which are shifted to the elevator when wheat is placed in commercial storage.

Some farmers feel that farm bins can be most efficiently used for other uses. For example, feed grains are fed on a farm and farm storage of such grains places them near the position where they will be fed.

Farm storage will probably continue to be an important part of the wheat storage system. Farm storage will be used to store wheat used on the farm for seed, feed and other home uses. Farm storage will also probably continue to provide temporary storage for large quantities of wheat during years when production is above average. Many farmers effectively use temporary storage when elevator storage is not available, then move the wheat into commercial storage when facilities are available. Some of the temporary storage facilities are used for livestock or machinery during the remainder of the year so the costs of storage are held lower than when wheat must bear the total cost for depreciation, taxes, interest on the investment in the building, and other fixed costs.

Many of the losses which occur during farm storage could be

prevented if farmers would exercise proper care in storage operations. Losses can be greatly reduced if only good quality, dry wheat is placed in storage and this wheat is given adequate care to prevent insect damage and entry of water or snow into the bin. The only bin of wheat sampled that declined in grade dropped to a lower grade because of insect infestation and no attempt was made by the owner to prevent this damage.

Many farmers who feel that the cost of farm storage is lower than the cost of elevator storage do not consider all the costs which must be included as costs of farm storage. Since only a small percent of the farmers hold wheat over six or seven months the cost of using elevator storage for such a short period is not as large as many farmers believe the cost to be. When farm storage is used for a longer period of time each year the actual cost of storage per bushel per month is reduced and any cost advantage of elevator storage is reduced.

Each farmer should consider his own storage needs. He should plan his storage program so as to provide adequate storage with the least possible total costs. Such a program will maximize profits from the wheat enterprise. Elevator storage, when available, will probably provide the most profitable storage for wheat to be held for only a short time unless cheap temporary storage is available on the farm. Some farmers have special needs which make farm storage desirable and costs of the farm storage can be greatly reduced if proper care is taken to reduce losses.

Heavy storage should be planned during years when there are

indications of adequate price increases to insure a profit from storage and lighter storage planned for years when there are indications of declines in price or inadequate increases in prices to make storage profitable. The average farmer is not always adequately informed concerning the various factors which normally cause such price movements to make storage plans on the basis of such factors.

Insects probably have greater influence in causing wheat to be moved from farm storage to elevator storage than they have in causing elevator storage to be used as the initial storage point. Although insects were inadequately controlled, they were not considered more important by farmers than other possible losses in causing elevator storage preference by farmers.

Research studies indicate that elevator storage of wheat is probably desirable if the average farmer desires to store wheat. Since elevators cannot handle all of the wheat during many harvest seasons, farm storage must be used at least for temporary storage. Many farmers will find it desirable to store on the farm even though the cost of farm storage may be higher.

Farmers who experience difficulty in delivering wheat to elevators during harvest, farmers who store for a long period of time (Probably eight months or longer.), and farmers with special storage need may find farm storage desirable and necessary.

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A STUDY OF THE FACTORS INFLUENCING THE LOCATION
OF WHEAT STORED BY FARMERS

by

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The purpose of this study was to determine some of the factors which should be considered by farmers when they are deciding whether to store wheat in farm storage or whether to store it in commercial storage facilities, and to evaluate these factors to determine their validity.

An evaluation of the most common factors may be used as a guide by farmers who are facing the problem of where they should plan to store wheat; by governmental agencies in planning programs concerned with storage; by members of the grain trade affected by farm storage and by the general public as consumers of the food crop.

The storage position preference of farmers and their reasons for these preferences were obtained by the author by survey-interview from 114 farmers in Ford and Thomas Counties. During August, 1950, 70 Ford County farmers and 44 Thomas County farmers were asked where they preferred to store their wheat and why. Basic information concerning the individual storage facilities and operations were obtained.

Farm bins were sampled on the assumption that insect damage or fear of insect damage was a major factor causing farmers to use commercial storage facilities. The bin samples were graded by the state grain inspection department at Salina, Kansas. Insects were counted by the author in the Department of Entomology laboratories, Kansas State College, Manhattan, Kansas, with assistance from entomology department staff members in identification of species of insects.

In Ford County 68.6 percent of the farmers interviewed favored farm storage for wheat while in Thomas County 79.5 percent of the farmers interviewed favored farm storage for wheat. Elevator storage convenience and reduced losses through elevator storage were the major reasons causing Ford County farmers to give greater preference than Thomas County farmers to elevator storage. Storage on the farm to get price increases was the major reason causing Thomas County farmers to give greater preference than Ford County farmers to farm storage.

The major reasons given by farmers for preferring farm storage included the following:

1. Farm storage convenience.
2. Farm storage is cheaper.
3. Store on farm to get benefit of price increases.
4. Store on farm to level income tax.
5. Farm storage as a reserve bank account.
6. Farm storage as a reserve seed storage.

The major reasons given by farmers for preferring elevator storage included the following:

1. Farmer gets the benefit of shrinkage.
2. Elevator storage reduces losses. (Fire, weevil, rodents, winds, and theft.)
3. Elevator storage is more convenient.
4. Farm bins not in physical condition to store wheat.
5. Wheat is easier to sell from an elevator.

Full elevators, crowded elevator conditions, and the convenience of farm storage caused more farmers to prefer farm storage than any other factor. Nearly one-third of the farmers interviewed favored farm storage because the local elevators could not provide the services demanded by farmers at harvest. When commercial facilities are not capable of meeting the demands of farmers, farm storage is necessary although it may not be desirable.

Many farmers underestimate the costs of farm storage because they include only the out-of-pocket or cash costs. Farm storage usually involves noninsurable risks which are shifted to the commercial storer when commercial storage is used. Research studies indicate that the cost of farm storage using new facilities probably exceeds the cost of commercial storage for the average farmer. If existing storage facilities on the farm have low fixed costs, if farm storage losses can be held to a minimum through proper care, or if wheat is held in storage for a long period of time the costs of farm storage are reduced and may not exceed the costs of commercial storage.

Seasonal price trends for wheat indicate that seasonal price increases are probably too small and too infrequent to pay the farmer to store wheat each year over a long period of time. Price movements make storage profitable some years but it is usually difficult to determine which years will be profitable.

Some farmers store wheat on the farm to level income tax.

Variation in production of wheat and other factors make calculation of possible taxable incomes a difficult task. A good farm budget probably would be the best guide to use to determine whether wheat should be stored to level income tax.

Farmers who prefer farm storage because wheat in farm storage is like a bank account often mentioned that one will give greater thought before buying if a load of wheat must first be hauled to town and sold instead of simply writing a check. Again a good farm budget should be the best indication as to the most desirable use of assets.

There are individual cases where farm storage is desirable to have a reserve seed storage. Some farmers need farm storage facilities for storage of seed wheat so that they do not have to buy wheat infested with weed seeds, ryo, or diseases. When seed is purchased a farmer usually pays a high price if he gets seed which is guaranteed to be free of such undesirable contents.

Many farmers store in commercial storage facilities to get the benefit of shrinkage. Much of the farm storage shrinkage results from binning of wet wheat or through improper care of wheat while in storage. Farmers often fail to realize that the shrinkage at local elevators is passed to the farmer in the form of lower prices or higher storage costs. Elevators probably can handle wheat with less shrinkage than if the wheat is placed in farm storage because of better methods, handling equipment and management but improved farm storage practices could reduce farm storage shrinkage.

If the farmer stores wheat in a bonded warehouse and obtains a warehouse receipt he shifts the risk of losses to the commercial storcer. Some of these losses are insurable such as those resulting from fire, wind, and theft while others are usually noninsurable and include those resulting from insects, rodents, moisture, and reduced market grade. Many farmers fail to include the insurable costs when calculating the cost of farm storage and also fail to realize that the risk of noninsurable losses assumed by the commercial storcer are included in the cost of commercial storage.

Elevator storage is more convenient for some farmers since their wheat crop may be located closer to a commercial elevator than it is to farm storage. Elevator storage also provides a convenient way to handle wheat if there is more than one owner and the crop is to be divided.

Several farmers reported that their farm bins were not in physical condition for wheat storage. This factor indicated the necessity of constructing only well designed and properly constructed storage units and that these units be kept in good repair. If farm bins are not in good condition and if the farm storage operations will not make new farm storage units profitable, the farmer should find elevator storage desirable.

Wheat is easier to sell if sold from elevator storage according to several farmers interviewed. There are cases where it is difficult to deliver wheat to the elevator and the farmer wants to market the crop. Convenience at the time of sale by having wheat stored in an elevator may require extra time and expense

at harvest if the elevators are crowded. In many cases a farmer can sell farm stored wheat and make delivery within a reasonable time.

Farmers interviewed did not mention future farm plans as a factor. The type of farming and size of operations should be considered when planning future storage needs or when planning to use commercial storage facilities.

Possible future governmental regulations such as acreage control or production restrictions should also be considered since such restrictions may determine whether the wheat crop is grown near the farmstead or whether it is grown nearer to an elevator.

The tests on samples from farm bins and insect counts on these samples indicated that much wheat is placed in farm storage which is too wet for satisfactory storage unless extra care is given to the wheat while it is in storage.

Farmers indicated that the wheat sampled in farm bins was to be held until after January 1, 1951. The removal of much wheat from these bins indicated that farmers change their storage plans after the wheat is placed in storage.

Losses through insect damage appeared to be no more important than other types of damage in causing farmers to prefer elevator storage. Insect damage to farm stored wheat because of storage of high moisture content wheat and through lack of proper care caused many farmers to move wheat from farm storage into commercial storage facilities.

There were 19 farm bins which were sampled three times. Six of these bins showed improvement in grade while only one declined in grade. The only decline in grade resulted from infestation by weevil and this farmer did not attempt to prevent insect damage through bin spraying or fumigation. The wheat also contained enough moisture when stored to grade as "Tough".

Although research studies indicate advantages through commercial storage of farmer owned wheat, some farm storage must exist because commercial storage facilities cannot always meet the storage demands of farmers at harvest.

Farmers who experience difficulty in delivering wheat to the local elevator at harvest, farmers who plan to store wheat for a long period, and farmers with special farm storage needs will probably form the group which can make the best use of farm storage. Use of improved methods of farm storage could greatly reduce many of the disadvantages of farm storage since farm storage is necessary in some cases to help provide better quality wheat for the market.